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Issue 48 April/May 1989 $3.75

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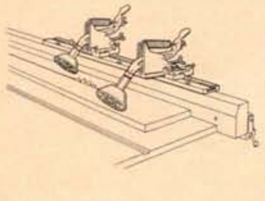

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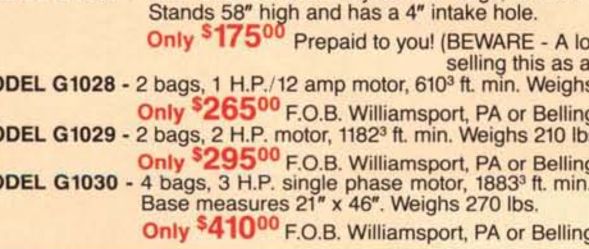

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On the Cover

You'd think after 4 million years mankind would have just about explored all the possibilities regarding wheel construction. Not true. On page 57, Tom Crabb takes a woodworker's approach to wheel design, implementing dowels as needle bearings and joining the rim pieces together with butterfly ties so they can be disassembled as necessary during construction. He tries out his ideas on a handy little cart project which he calls "The Plant Mover."

Tom Crabb

Clear Cuts

We don't generally have much to say about hand sanding in PW. It's the kind of thing you just do because you have to, and it doesn't really merit a lot of comment.

In "The Zen of Sanding" Hugh Foster took a stab at making it attractive by pointing out the meditative effect of the back–and–forth repetitiveness, and suggesting we use this time to clear our minds. He tells me that listening to Mozart helps, too.

I like to watch television while I sand, but the only TV in our small house is in the living room, and My Beloved has this thing about sawdust in the couch.

Many craftsmen rely on planes and scrapers to prepare their surfaces for finishing. Others endure the noise of belt sanding to get things started and then progress only as far as a vibrating "finishing" sander, all the while filling their lungs with the stuff my wife vacuums out of the couch.

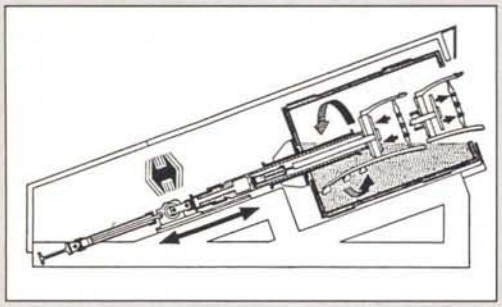
Grinding away at wood rather clashes with our more romantic notions of what woodworking is; besides, a belt sander is often inappropriate. A chair for example has too many tight places for any machine. Besides, if you've made a piece as complex as a chair, you really owe it the most diligent progression through the finer grits in life, and hand sanding is the only way it can be done.

At least, that used to be the case.

What follows is from a press release that crossed my desk recently:

Cattinair Develops Chair Sanding Machine

The French company Cattinair has developed a new machine for sanding chairs that eliminates the tedious task of hand sanding. The Chair Sealer Sander produces a uniform finish without continual adjustment and maintenance, creating additional savings and greater productivity for manufacturers of office and residential furniture. One operator can handle 400-450 chairs per day with consistent quality.



The new Chair Sealer Sander consists of a drum containing a bath of abrasive glass beads and an extendable/retractable jack equipped with an air clamping feature. This takes hold of the chair, then the shaft and chair retract into the drum. The drum is rotated in two directions; during the rotating cycles the chair oscillates in the bath of abrasive glass beads.

The machine also includes a built–in dust exhaust system, as well as an automatic start and stop safety system, which helps to keep the abrasive beads clean. The original model has an opening which can handle chairs up to 43" high with a 19" square base. A new model which is currently being introduced has a larger diameter of 48" and has been especially adapted for use with armchairs.

For further information, contact: Mr. Guy Lormeau, Cattinair Corporation, 103 D Creek Ridge Rd., Greensboro, NC 27406, (919) 274-9999.

Now let's see, where would this thing fit in my shop...?

David M. Camp

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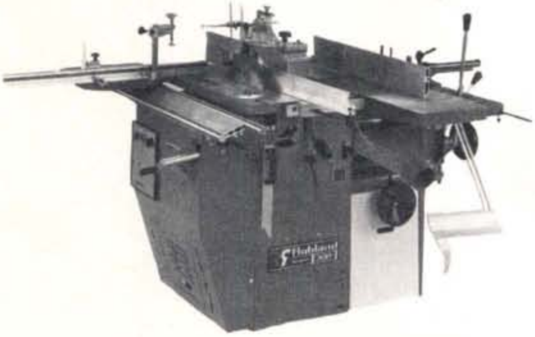

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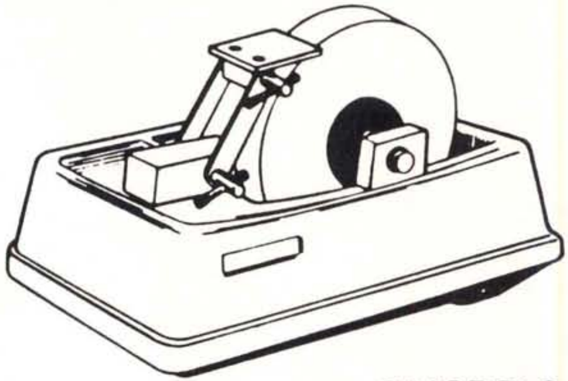

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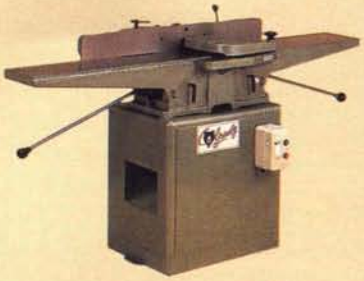

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12″ × 30T × 1″	162	97
10″ × 40T	156	94
30T	135	81
9″ × 40T	146	88
30T	125	75

	List	Sale
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30T 3/32″	115	69
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10″ × 60T × 5/8″	162	97
9″ × 60T × 5/8″	156	94
8″ × 60T × 5/8″	150	90
New 8 1/4″ × 40T × 5/8″	136	82

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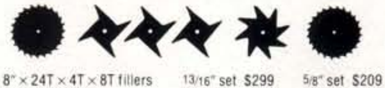

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DURALINE HI-AT
Note: *Fine Woodworking Editorial Nov./Dec. 1988 No. 73 pg. 65 S.N. recommends high alternating top bevel (ATB) thin kerfs and large blade stiffeners for smoothest cuts on RADIAL SAWS, etc.*

Jim Forrest, President and designer, microscoping cutting edge.

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Ryobi-Makita	14″ × 100T × 1″	266	160
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Hooked on Twigs

I enjoyed "Peel Yourself a Settee" (*PW* #44, August/September 1988) so much that I decided to try the project myself. We have a large maple grove on our property, so I made my twig settee from that. I had some trouble with splitting so I decided to drill holes for the nails. I was very pleased with the results. After finishing the settee, I designed a chair, and I just finished making it out of wild cherry.

I spotted a twig chair made of hickory in a catalog and was amazed at the price they were asking! We have some hickory trees, but I don't want to sacrifice the tree to get at the branches. I will probably resort to locust which are plentiful, straight and strong. There is also an abundance of vines on our property, and I intend to use them in some way because of their bending qualities—even though they are a bit lacking in charisma.

Wray G. Zelt III
Washington, PA

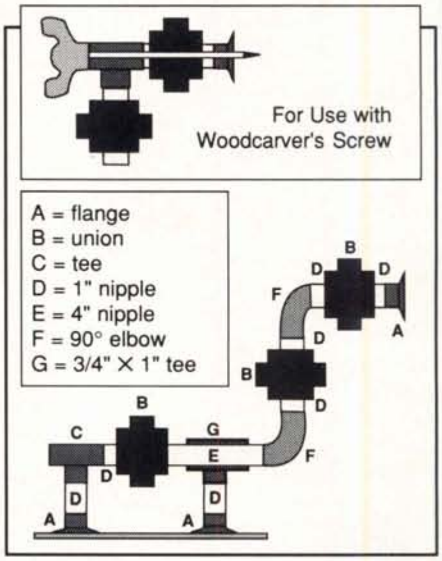
Plumbing for Woodcarvers

In his "Focus on Carving" column in *PW* #44 (August/September 1988), William McMaster showed an adjustable work positioner made from common pipe. How is it made?

John E. Twisk
St. Paul, MN

William McMaster replies: I made this work positioner about ten years ago as an alternative to the very expensive commercial power arms. Although it's not as convenient as the more compact commercial ones, it does the job well.

All of the parts are made from 3/4" pipe except for G, a tee that has a 3/4" diameter vertical section and a 1" diameter horizontal section. This piece acts as a support for the straight section (E) and permits rotation around the horizontal axis. The unions (B) are what allow the full three–dimensional rotation for the positioning of your carving; make sure all three are the same size so you can use the same wrench to secure them.



The illustration above shows the work positioner as I made it; I used a tee at the end because it was what I had on hand at the time—an elbow would work just as well. In fact, by trading this tee with the uppermost elbow, you could run a woodcarver's screw through the assembly as shown in the inset.

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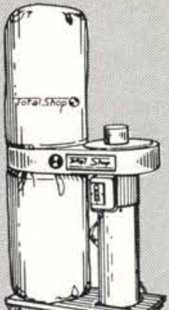

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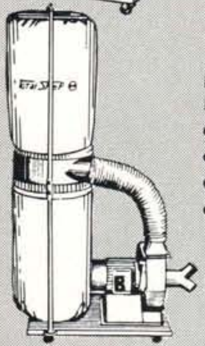

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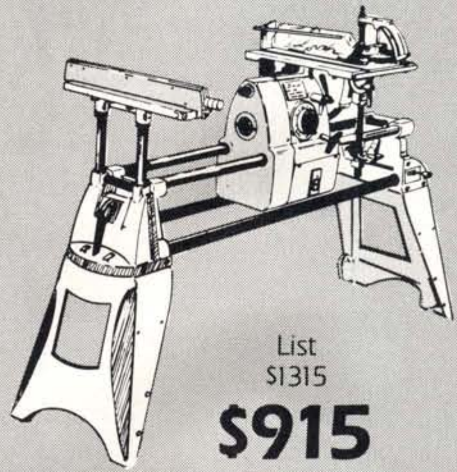

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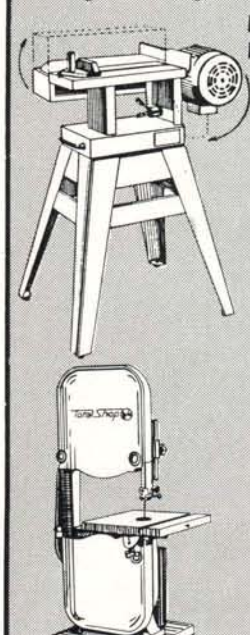

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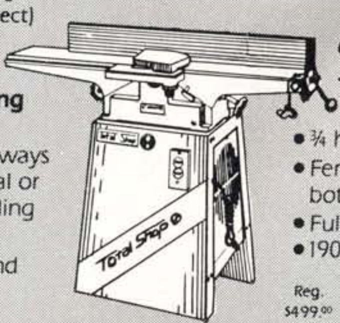

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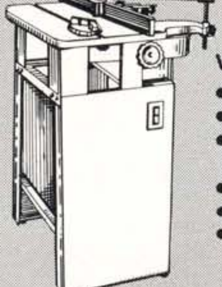

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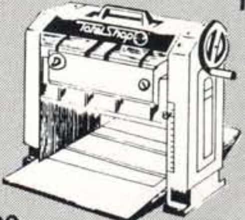

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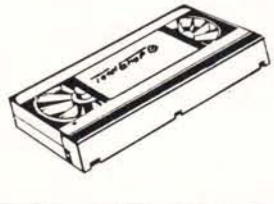

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Glue Brushes

I make inexpensive brushes for spreading glue from a wooden scrub brush available at the grocery store. The tufts are mounted in holes at a slight angle and are held in place with a metal staple. I set my table saw blade at the angle of the tufts and cut the brush apart between its twelve rows of four tufts each. I use a chisel to cut the sections into smaller sections depending on how many tufts I want (I usually make a few with four tufts and several others with two and one tuft each). Then I tack on a wooden piece that's 1/8" × 3/4" × 8" handle.Now I have brushes that are so cheap that I can forgive myself if I happen to leave one to harden in the glue.

John E. Leeds
Ojai, CA

Shop Filing System

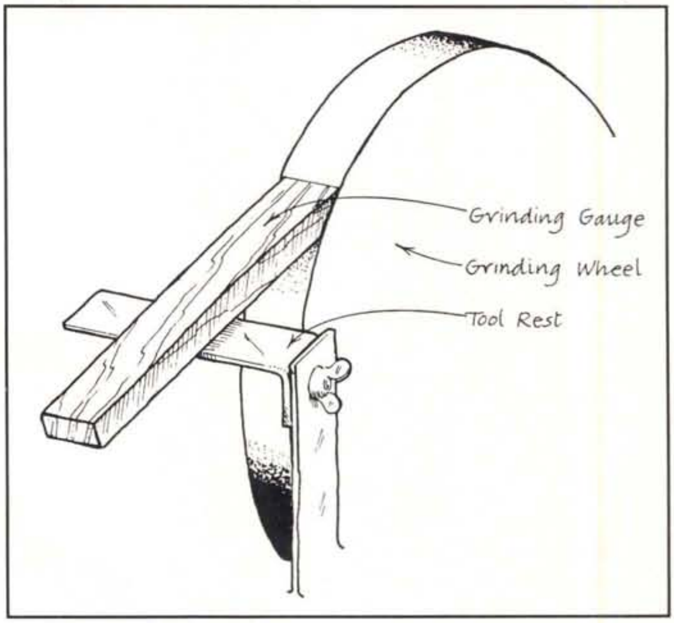
Serious readers of the various shop publications keep every issue and soon have the house and the shop filled with these old editions. When the time comes to look up a specific article or make a general review of some particular procedure, they have problems retrieving the needed material.

I solved this problem by removing the articles that I want to save from the magazine and stapling the pages together. Then I determine major categories, such as Tools, Furniture Plans, Finishes, etc. and assign a color code to each category. "Tools," for example, might be green. I make up a separate green file folder for each subheading under tools that I want—a green folder for articles pertaining to the table saw, one for router articles, and so forth. If you can't find colored file folders, use colored labels or just identify the folders with colored felt pens. You can go through the whole gamut of your interests and arrange an ideal filing system tailored for your individual needs.

Hugh F. Williamson
Tucson, AZ

Grinder Gauges

A setup gauge made of hardwood or metal will simplify setting the tool rest on your grinder when it's time to grind your tools. I made a separate gauge for each frequently used angles (i.e. 30° for chisels, 25° for planes) from some 1/2" × 1-1/4" hardwood. With these it's easy to make repetitive settings and avoid excessive grinding on your tools.



Devore O. Burch
Fort Worth, TX

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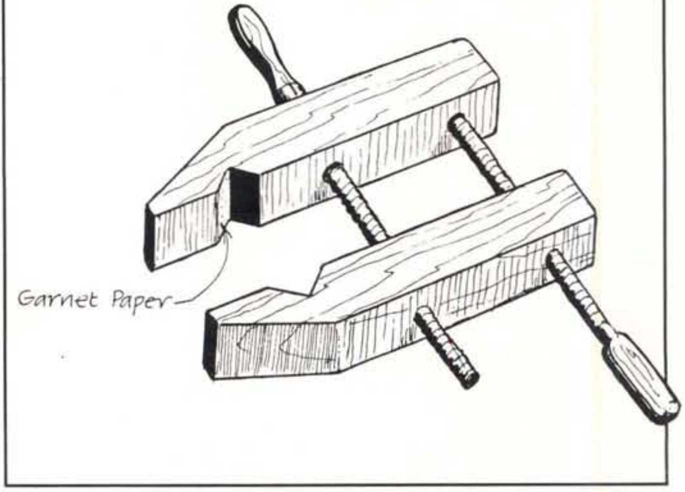
By making V–cuts in the end of one of my handscrew clamps I created this handy drill press aid for drilling the ends of round stock. Cut out the notches on the band saw and line them with inner tube rubber or 60–grit garnet paper to prevent slippage. Best of all, the clamp can still be used for other purposes (just don't put quite so much pressure on the tip).



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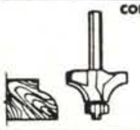

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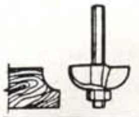

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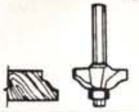

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Book Reviews

by Hugh Foster

Portable Circular Sawing Machine Techniques by Roger W. Cliffe (Sterling Publishing Company, Two Park Ave, New York, NY 10016; © 1988), 352 pages, paperback, $14.95

In this, the latest in his series of books about saws and sawing, Roger Cliffe tells us more than we thought possible to know about portable circular saws, mitering machines, pull–stroke mitering machines, and specialty and stationary circular saws. Upwards of 920 photos and drawings help to illustrate his points about each of these tools. Readers may use it as a shopping aid, true enough, but this book also shows us how to get maximum utility from each kind of portable circular saw.

The book's main section contains information about blades and safety as well as a brief history of the portable circular saw. The next section teaches us how to make the basic cuts with a portable saw. Clearly, if we follow Cliffe's teachings, the portable circular saw can become a formidable tool in our hands too. He starts with the easy stuff: crosscutting and ripping, mitering, cutting plywood and other sheet stock. Then he advances to the harder stuff like "Getting a Straight Cut," plunge cutting, irregular shapes, and cutting framing members. Maintenance, a topic too often ignored or ill–treated, is treated thoroughly here.

Both varieties of chop boxes are covered here as well. If you couldn't really think of enough uses for such a saw, this book may help you to change your mind. The next section of the book deals with saws like the INCA radial arm saw, which is far too portable to be considered a stationary unit.

The book closes with a section of shop–built projects. One or more of the saw–bucks, sawing benches, or the like, shown here will appeal to practically every woodworker. Overall, it looks as though Dr. Cliffe has presented serious woodworkers with another fine book.

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Woodworking Projects III and Woodworking Projects IV. Editors of *Hands On* magazine (Rodale Press Books, 33 E. Minor St., Emmaus, PA 18049; © 1988), each 96 pp., $9.95 paperback or $14.95 hardcover

Hands On is the publication of Shopsmith, Inc., for folks who use the Shopsmith multipurpose tool. The only specialty tool required in any of the projects is the Shopsmith Router Arm, and projects that require it are so indicated.

The projects in these books range from easy to advanced, and most of them would make fine gifts. Volume III contains projects in three categories: Accents and Accessories, Toys and Games, and Indoor Projects. Volume IV contains Odds and Ends, Accents and Accessories, and Outdoor Projects. None of these projects is exactly what you'd call a dog, but the Outdoor Projects are among the more handsome I've seen. Their picnic table and bench, for instance, *will* save a weekend woodworker a good sum of money over the cost of commercial picnic furniture, and the results are sure to be better than the commercial product. The planters are also particularly handsome. These books each contain about four dozen project plans, well illustrated with first quality photos and drawings. Both these books are well worth your consideration. PW

***Hugh Foster** is an English-teaching woodworker in Manitowoc, Wisconsin.*

Wood Finishing with George Frank by George Frank (Sterling Publishing Company, Two Park Avenue, New York, NY 10016; © 1988) 144 pages, hardcover, $19.95

At first glance, *Wood Finishing with George Frank* seems to be a thin, overpriced book. Look more closely. Part of what has driven the price up is the fifty-page color section which shows large segments of various finishing results. Since most woodworking books are printed only in black and white, this sumptuous color section is particularly appreciated in a book about finishing where color and result are, quite simply, *everything*.

There are few formulas in this book, and author George Frank gives us his techniques in a most off-hand manner. Through most of the book, it seems as though we're reading a gossipy, almost scandalous little book about famous people for whom Frank has finished furniture over the years. It's a real page turner. It is probably during the second reading that the facts begin to sink in as we read past the "human interest" story into the wood finishing business.

Some of us will never devote the kind of effort and attention to wood finishing that George Frank has given all his long life. Altogether too many of us build a piece as a "labor of love" and then slap on a coat of oil or pigmented polyurethane, apparently in hopes of getting the project out of the shop just as quickly as possible. According to the old school, finishing the project should take between a thirty and forty percent of the project's total time. George Frank reminds us, gently, always gently, that the project we just spent 120 hours to build deserves more than a quick coat of tinted varnish. He doesn't really expect us to French polish everything, but he's sure to regard his book a success if he forces us to stop and think before we finish something quickly and foolishly. After all, a well-applied, appropriate finish enhances a project like nothing else can. Three cheers for Sterling for catching these glimpses of a master finisher at work.

Relief Woodcarving and Lettering by Ian Norbury (Linden Publishing Company, Inc., 3845 N. Blackstone, Fresno, CA 93726; © 1988) 157 pages, paperback, $15.95

Ian Norbury is among the world's great carvers. In his hands, carving gouges, knives, and other tools produce not craft, but art. Of course, art is not a "process" that can be readily described—as soon as it is described, it's no longer art. So, Norbury, in this book, doesn't include the general principles which can be found in many other books on the subject. Instead, he has included his current work which he hopes will be to the taste of his audience. His criteria for judging what to include was related to the salability of pieces he has carved; as a professional carver, he "cannot afford to produce pieces that do not sell."

Norbury describes relief carving as a decision-making process. He says: "I found relief carving difficult, more so than in the round, because there is no definite shape. If you carve a three-dimensional head, it is either the same shape as the real one or not. But with a relief it doesn't try to be the same, only to *look* the same, and that makes it a matter of personal judgement, not measurement." Then he goes on to illustrate with examples from his own current work. Some of the examples are quite simple, but others are excruciatingly complex.

The portion of the book we may best emulate deals with lettering. Norbury treats this so plainly that we might learn to do lettering well enough that when we one day perhaps have something to say, we may say it in wood—beautifully. Just keeping that in mind will be enough to keep me reading books like Norbury's.

Shoji: How to Design, Build, and Install Japanese Screens by Jay Van Arsdale (Kodansha International/USA Ltd., 10 East 53rd St., New York, NY 10022; © 1988) 96 pages, paperback, $15.95

The author of this book credits Jeffrey Westman for most of the photos and Donald Dean for the drawings. These credits are well worth noting because it is hard to tell whether the text matches the beauty of the illustrations—or vice versa. At any rate, this profusely illustrated short book is a feast for both the eyes and the mind.

Shoji, as you can tell from the title, are Japanese screens. Van Arsdale's book is an attempt to move *shoji* to a context larger than the Japanese home. He hopes to translate the idea of *shoji* into contemporary, international vocabularies. Having *shoji* in our homes, he suggests, will change the pace of our everyday lives—for better or for worse—in response to the "special rhythms of light and shadow." He reminds us at the outset that book learning is no substitute for the repetitive practice of apprenticeship, so while one could learn to design and build *shoji* from his book, it is more likely that by reading it we will learn to see in *shoji* "not just a paper-backed, wooden-frame lattice but the embodiment of an architectural tradition of great beauty and sophistication, one that can enrich our lives as well as our living spaces."

The analysis of wood species for *shoji* is interesting. Most of the woods associated with western woodworking must be glued, but the traditional Japanese *shoji* are only pressure fit. Paper and paper substitutes are discussed as well. The inner covers of the book appear to be a variety of *washi*, traditional *shoji* paper made from the inner bark of *kozo*, the paper mulberry tree. The book suggests that fiberglass and even Tyvek®, American synthetic moisture barrier paper, can also be used.

Typical American use of *shoji* ranges from drapes, curtains, or blinds (in front of windows and doors), to pass-throughs that connect rooms within the home, or in front of closets or other storage areas. *Shoji* are installed sliding, hanging, bifolding, or freestanding.

The section about tools describes the differences between Japanese and American tools—in light of the many books available about Japanese tools, you could expect this material to be redundant—but this book unlocks the secrets about Japanese tools that the other texts only mention. Not only are the functions of the tools treated, but also the business of sharpening them.

The chapter entitled "Making a Simple Screen" opens with this simple sidebar: "No amount of planning will produce the desired results unless you keep two things firmly in mind: Measure everything exactly and keep your saws, planes, and chisels sharp." With this firmly in mind, one may proceed to planning and building the screen.This chapter comprises fully twenty per cent of the book, and the technical data in it is clearly, succinctly expressed. Suffice it to say that this chapter will bear several readings as one prepares to build one of the "Projects for the Home" described in the next chapter.

The projects chapter begins with photos and drawings of "western" *shoji* projects built by the author. It proceeds to a catalogue of lattice patterns and fourteen real projects. As I study the projects, I suspect my first *shoji* project will be a lamp based on the lantern shown on page 89. A short appendix treats the subject of maintaining home security without sacrificing the airiness *shoji* provides. The appendix also contains a very complete short bibliography of books on Japanese Tools and Woodworking, a list of American vendors of *shoji* papers (these ten entries appear to span the continent), and an incomplete list of vendors of Japanese tools (several major national vendors I know of have been omitted from this list), and a very complete index.

If you're even remotely interested in *shoji* or Asian influenced design, buy this book. If you want 1988's most beautiful book about woodworking, buy this book. It is fully up to Kodansha's standards for both beauty and thoroughness of presentation. Keats suggested over 150 years ago that "A thing of beauty is a joy forever," but the following no doubt badly translated Asian verse may suggest all we need know about this book's treatment of its subject:

> even the smallest *shoji*
> is as big as the moon

A woodworker might have to be soulless to fail to appreciate the beauty here. **PW**

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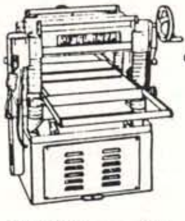

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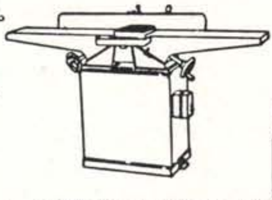

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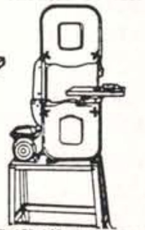

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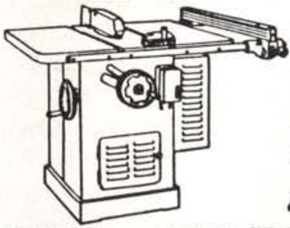

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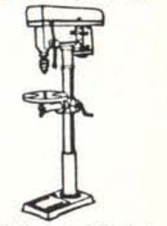

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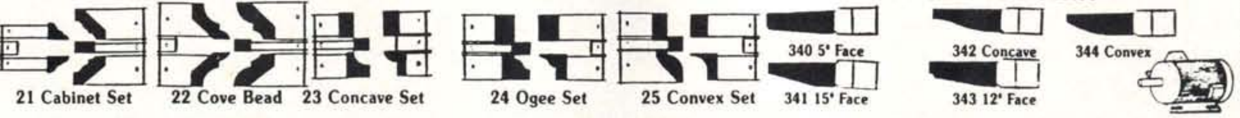

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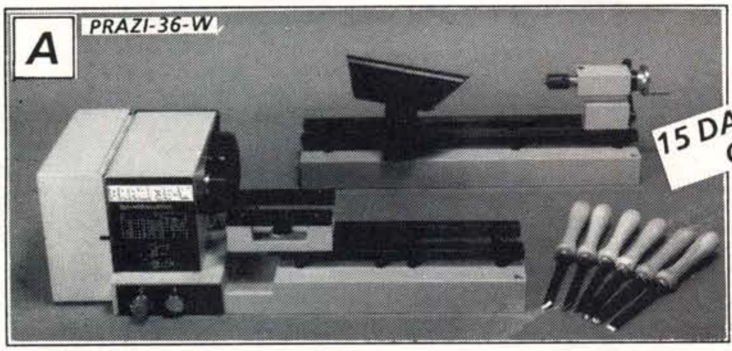

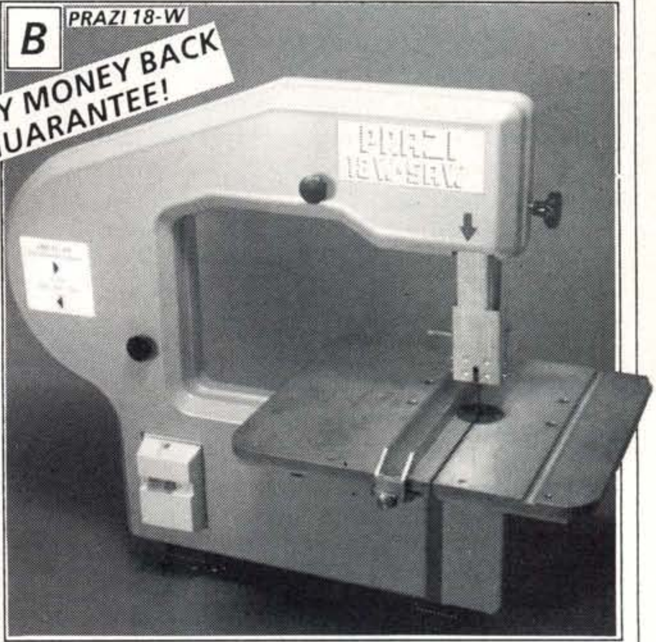

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Videoscene

by Alan Marks

The Hole Story with Don Strong, (©1987 WRG Productions, RFD 1, Box 46 A, Pelham, New Hampshire 03076), 90 minutes, $59.00 plus postage and handling

In my previous column I discussed several videos on face frame cabinetmaking and mentioned the 32mm system. This time, I'll look at videos pertaining to this system, which is used mostly in modern European manufacturing.

This first tape, *The Hole Story* was created to show cabinet shop owners the advantages and disadvantages of the 32mm system. In it, Don Strong interviews William R. Greenwood, owner of Pelham Woodcraft in Dracut, Massachusets. The two walk us through and discuss the entire production line of Greenwood's 85,000 square foot plant which recently converted to the system.

Prior to converting, Pelham Woodcraft made only face frame cabinets, but the company found it increasingly difficult to compete. Face frame cabinetry done the Pelham way required careful measurement of completed spaces before production could begin. Contractors, impatient with this method, were increasingly turning to immediately available, ready–made cabinets. Pelham was also up against a shortage of skilled labor and a lack of available space for expansion. Faced with a shrinking market, Bill Greenwood took decisive action.

This video documents the steps he went through in his conversion to the 32mm system. We are told how all major decisions were made along the way. First, Greenwood looked at what could be gained by the conversion, carefully reviewing all available trade literature on the subject. He found it offered high–speed output, automated production, low cost, freedom from dependence on skilled labor, and the possibility of building up an inventory of exchangeable parts. Best of all, it would no longer be necessary to wait for homes to be built before beginning production. With a complete inventory of parts, made from flat sheet stock and pre–drilled for assembly and fittings, complete kitchens could literally be assembled overnight and delivered the next day.

The pun behind the tape's title, The Hole Story may not be readily apparent to anyone unfamiliar with the 32mm system. The story is essentially this: all hardware positions, shelving adjustments, cabinet dimensions and dowel centers are based on multiples of 32mm (approximately 1-1/2"); and the positioning of all of these occurs by means of precision–bored holes. Hinges are inserted in flat–bottomed, 35mm diameter holes and all other holes are sized metrically.

Most significantly, the 32mm technique does away with face frames altogether so all parts are cut from sheet material. With this system (as implemented by Pelham Woodcraft), a shop can concentrate on producing so called "generic" parts: pre–drilled doors and cabinet sides that may be flipped to fill either a right–hand or left–hand function.

Besides improving profitability due to ease of construction and reduced material costs, European–style cabinets have wide esthetic appeal due to their clean lines. Above all, they are quality products; they have to be made properly because unless extreme care and accuracy are exercised in machining them, the components cannot be assembled.

Greenwood addresses potential problem areas requiring careful consideration in any conversion, including financing, delivery contracts, electrical requirements, transportation of the new machinery, installation, preparation of foundations and production line planning.The tape gives a complete tour of Pelham's production line, beginning with the handling of raw sheet material and concluding with the shipping of completed cabinets.

He even shows us how the design for a certain line of cabinets was arrived at, through developing component sizes that permitted using the 32mm modular construction without deviating radically from US standards. Choice of hardware had to be made concurrent with machinery choice.

The high level of automation reached at Pelham need not be the goal for the small cabinet shop to benefit from this type of conversion. Pelham has equipped itself far beyond what is necessary to service the immediate community. In the tour of his plant Greenwood points out machinery, such as small edge–banders, dowel and hinge insertion equipment, and boring equipment which are eminently suitable and affordable for the small cabinet shop. As the tape makes clear, even a one–man shop can gain from the change. I think every kitchen cabinet operation owes it to itself to find out about this subject, and I can't think of any better introduction than this video.

Making Kitchen Cabinets with Paul Levine, (©1988 The Taunton Press, 63 South Main Street, Box 355, Newtown, CT 06470) 60 minutes, $29.95 to buy, or $14.95 to rent

Levine implies that he has worked out an adaptation of the 32mm system that does not demand special machinery or tools. As I said above, the term "32mm system" refers to an elaborate modular technique of producing cabinets using multiples of 32mm to determine dimensions, dowel spacing and hardware locations. All that Levine's cabinetry has in common with 32mm is the hardware and the lack of face frames. The methods he discusses are suitable for amateurs who want to get results that look professional.

The video can be purchased separately or together with a book of the same name; a package of both book and video is available for $39.95. The book may be obtained separately for $17.95 and has 192 pages, 80 color photos, and 100 illustrations. Page references in the video coordinate with the book.

There is considerably more material covered in the book than is attempted in the video, including planning a kitchen, making countertops and backsplashes, cabinet finishing and installation. I wouldn't go so far as to say that the video is worthless without the book, but I would say that I *prefer* the book to the video. In the video, Levine walks us through the construction of a base cabinet with two doors and a drawer. He starts out with a discussion of materials and hardware, then

---

***Alan Marks** is a cabinetmaker in Carmel Valley, California, and a contributing editor to* PW.

applies plastic laminate with contact cement. He cuts tongue and groove joints with the table saw, then assembles the case using drywall screws and a pneumatic staple gun. He intentionally lets edging overlap, and trims it with a flush trim router bit. He shows how he drills 5mm shelf support holes. His demonstration on cutting dovetails with a dovetail jig was unclear on the tape. Levine concludes with a demonstration of how he mounts the slides and hinges and how he hangs and adjusts doors.

The technique propounded by Levine provides a practical way for the home craftsman to produce frameless cabinets with basic machine and hand tools, but his methods don't appeal to me for several reasons: I do not like fastening edge banding with brads. I prefer dowelled construction to tongue and groove because it ensures precise alignment with no chance of slippage. I also disapprove of overlaying and screwing 1/4" back panels on cabinet carcases in such a way that they can be seen from the side, even though they will eventually be covered by molding or countertop. The better and more efficient way would be to rabbet the sides, top and bottom, to accept the back panels.

My reaction to this video is mixed. I don't really see why it was necessary to create an entire book *and* a sixty–minute video whose only real contribution is to describe the use and adjustment of a new type of hinge. I wonder how many will be misled into believing *Making Kitchen Cabinets* is a complete guide to the subject. **PW**

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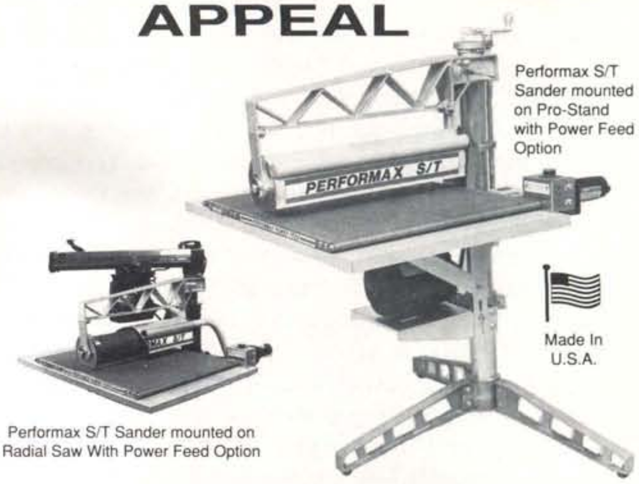

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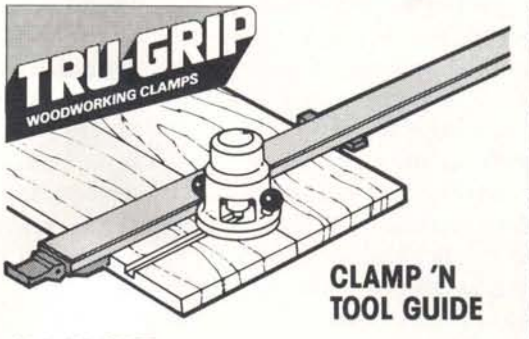

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by Peter Good

Employee or Independent Contractor?

One of the most common trouble spots for a woodworking business at tax time involves the difference between employees and independent contractors. Both the business owner and the IRS have a keen financial interest in the matter. It is in the financial interest of the IRS that every person who performs any *service for* a business be classified as an employee. On the other hand, it's in the financial interest of the business owner that every person who performs any service for them be classified as an independent contractor. If you're calling someone who works for you an independent contractor when they're really an employee, or if you're paying someone under the table and keeping the whole thing kind of quiet, it will be an unhappy day indeed when the sleuthing computers at the IRS discover a financial irregularity or imbalance in your accounting and the alarm bell goes off. Life isn't long enough to be having disagreements with the IRS, so I'm going to give you some guidelines on how to stay out of trouble by knowing the distinctions between an employee and an independent contractor.

From the business owner's point of view, the main reasons for classifying someone as an independent contractor are the avoidance of paying worker's compensation insurance, F.I.C.A. (social security) and unemployment insurance. Additionally, it eliminates income tax withholding and deposits, employment tax reporting and a mountain of time–consuming bookkeeping and paperwork. From the viewpoint of the IRS, the primary reason for classifying someone as an employee is that they get the income tax and social security money faster—never later than 45 days after an employee is paid—instead of quarterly, or at the end of the year as is the case with independent contractors. With Federal spending and a national debt as high as we have, the government has to get its hands on cash as fast as possible to beat the wolf away from the door. If you are an employer, you are a direct route to quick cash for the IRS. You may be happy to comply, knowing that you are aiding your country by servicing the national debt and warding off the financial collapse of the country. On the other hand, you may be having enough trouble warding off your own financial collapse, and classifying a worker as an independent contractor may be an appealing way to go.

Some Guidelines

So, what's an independent contractor and how is he different from an employee? The IRS has developed a long list of qualifying factors designed to determine who is and who isn't an independent contractor. Basically, an independent contractor is someone who is operating a business which is clearly their own. An independent contractor should not work on your premises. If they do, it looks like an employee to the IRS. An independent contractor should not be paid in same–size amounts or according to any regular schedule, because that looks like a salary, which means employee. Instead, the independent contractor should be paid a single contracted amount for performing a specific, finite service. A contractor should have their own shop or place of business where the work is performed. If the work is performed on your premises, you should rent space for that purpose to the independent contractor and this should be documented with record keeping and cancelled rent checks. An independent contractor should not use your tools, equipment, vehicles, phone, business name, address or stationery. With a contractor, you may specify the end result, but not the method by which it is achieved. Detailing procedures or methods of work would typically be the case if you are dealing with an employee, but you would not normally administer such instructions to another business, since they presumably know what they're doing and have preferred and established methods of doing it, so long as the results are what you wanted.

If you are dictating to someone how you want something done, that may classify you as their employer in the view of the IRS. Also, you may specify the completion date of jobs to a contractor, but not the hours or days of work. Although it's not a big point, a contractor will look a lot more believable to the IRS if he or she reports income from you using a Federal tax I.D. number on a business tax return, rather than a social security number on a personal tax return. Before doing business with a contractor, it's essential to obtain their tax I.D. number or social security number. You must have one or the other to report the payment.

It may also be difficult to refer to someone as an independent contractor when you are that person's only customer. It's entirely possible that you may *need* to keep a subcontractor busy full time; however the government's reasoning may be that this surely must be an employee, otherwise he would be doing work for others also. In this sort of situation, the other qualifying factors for independent contractor status will weigh heavily. This could be a sticky affair if the IRS contests your claim that this other person is an independent contractor unless you can demonstrate that he is operating a business which stands completely on its own. These are guidelines which should put you on the right track, but if you have questions about your particular situation you may want to consult an accountant or attorney.

Red Tape

At the end of the year you will need to fill out a Form 1099, which isn't very complicated, and send one copy to the independent contractor, one to the IRS, and keep the last copy. The 1099 is simply a statement of the total amount which you paid to the independent contractor. Additionally, you summarize all of your 1099's on Form 1096 and send it to the IRS. (This is a picnic compared to the reporting and paperwork required if you have employees.)

If, after examining your particular situation, you determine that you have a weak case for claiming independent contractor status for someone who you're dealing with, (or worse yet, you *know* they're really an employee in disguise,) it's better to just call it as it is and claim them as a legal employee. It will cost you a bit more, will take more of your time, and will increase your paperwork, but you'll have no beef with the IRS and the peace of mind from that will outweigh all of the drawbacks. PW

As the owner of Grand Openings in Oakland, California, ***Peter Good*** *manufactures doors. He also gives seminars at national woodworking shows on the business aspects of running a small shop.*

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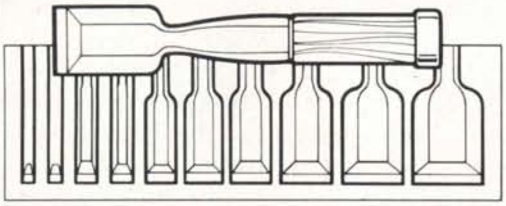

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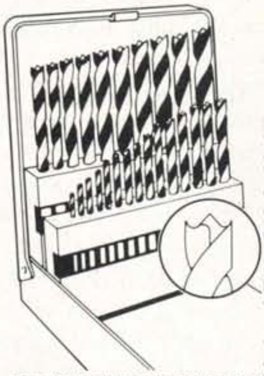

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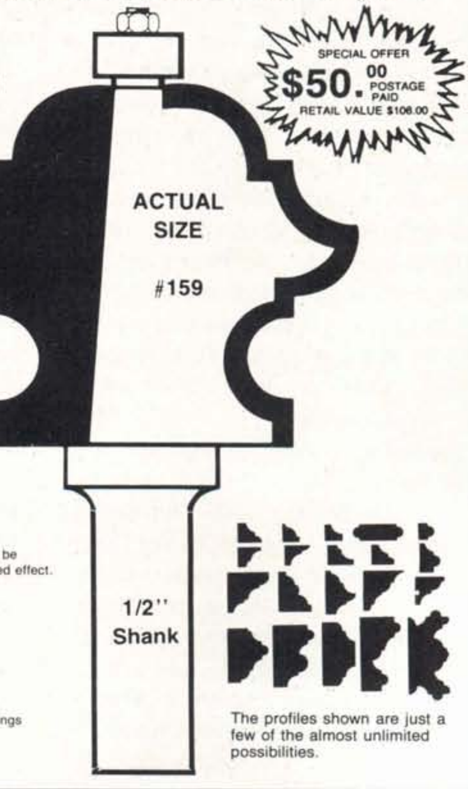

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Tried and True

by Graham Blackburn

Threading Tools: Screw Boxes & Wood Taps

Threaded metal rod is now so universal and easily obtainable that the use of wooden threads is rarely seen. Not so long ago, however, an almost endless variety of things were assembled, adjusted, and operated with the help of wooden threads. Most woodworkers are probably familiar with wooden–threaded handscrews (now replaced commercially by the Jorgensen–type handscrew which uses metal threads), and many have probably seen old workbenches fitted with vises that are operated by large wooden threads. But equally common were wooden threads used in cider presses, printing presses, the adjustable arms of plough planes, broom handles, drawer knobs, lathe poppets, all types of furniture—including early "knock–down" fittings, such as bed parts, and a host of other everyday items.

The tools used to make these threads—the screw box and its matching wood tap—are simple and easily made; as many user–made examples of these survive as do commercially made models. They may still be used by the average woodworker with great results and can often add that extra something to an otherwise run–of–the–mill project.

As with many other basically simple tools, the screw box can trace its beginnings back into the mists of antiquity. Archimedes, who lived around 250 B.C., is credited with discovering the principle of the screw; Pappus of Alexandria recorded a method of designing threads in the 4th century A.D.; and the Romans are known to have used screws. They obviously must have had screw making tools.

By the early 18th century, the screw box as we know it today was fully developed. By the mid–19th century, screw boxes were being made commercially in great numbers by such European firms as Alexander Mathieson and Sons of Glasgow, James Howarth of Sheffield, Holtzappfel of London, Marples and Sons, Moulson Brothers, Ibbotson Brothers, and many others. Interestingly enough, American makers are unknown, although the existence of large numbers of foreign–made tools all over America demonstrates their equally common use on this side of the Atlantic.

Despite their abundance and popularity, however, there was little if any standardization with regard to thread sizes and pitch. This lack of standardization was part of what led to their decreased manufacture and use. There is currently only one major manufacturer of screw boxes—and ironically that is an American firm (Conover Woodcraft of Parkman, Ohio). This lack of standardization was a factor because a screw box without a matching tap is about as effective as one hand trying to clap. Since the two items appear to have a great propensity for separation the moment they leave the possession of their original owner, one now rarely finds a complete pair.

With this in mind, you will save yourself a lot of time and trouble if you restrict your purchases of threading tools, new or secondhand, to complete, matching pairs. It is possible, as many old-timers did, to use either a single screw box or a single tap to make its mating tool; but it may not be worth the effort considering the work involved, and the chances of later finding a mate to whichever part you obtained singly are remote. This will be apparent from the fact that a typical 19th century tool merchant's catalog often listed as many as twenty different thread diameters—and none of the pitches or threads per inch of those twenty sizes might match those of another manufacturer's selection!

The Basic Design

Despite the wide variety in sizes and styles, most screw boxes and wood taps are remarkably similar in their basic design. Taking the time to examine their parts and features, and thereby gaining an understanding of this design, will ensure more rapid success when you attempt to cut your first wooden threads.

The Bottom Block

Screw boxes were made from a variety of close–grained medium hardwoods such as apple, pear, hornbeam, beech, rosewood, boxwood, and even walnut. European beech was the commonest commercially used variety. Some makers also made cast–iron boxes, but these are relatively rare.

The box itself consists of two parts: the bottom block and the upper block (see Figure 1). The bottom block is the smaller part and contains a hole of the same diameter as the rod to be threaded—the **basic thread diameter**. In order for the threads to be cut properly, it is very important that the rod be fed in with perfect alignment; this is what this hole in the bottom block is designed to do.

Consequently to avoid wear—which would compromise the required alignment—the bottom block is often made of a harder material than the rest of the screw box; beech screw boxes with bottom blocks made of boxwood are common, and sometimes even metal bushings can be found lining the hole. The bottom block is fitted and held to the upper block either with screws or simply with dowels, enabling it to be easily removed (for reasons explained further on). It is also likely to have a shallow mortise in its inside face to receive the end of the cutter–holding clamp, which protrudes from the upper block.

The Upper Block

The upper block, which is considerably larger, is bored with a hole of the same diameter as the intended **thread root** (the diameter of the threaded rod measured across the bottom of the threads). This hole is then tapped to the required size. Since wood is not as stable as metal, clearances between threaded rod and tapped hole need to be greater than is usual in metal. To guide the user as to the best size hole to be tapped for the thread made with any particular screw box, manufacturers frequently marked the upper block with an inscribed circle of the recommended diameter as shown in Figure 2.

The Cutter

The cutter is fitted at the beginning of the thread on the inside face of the upper block. The correct adjustment of this cutter is the whole secret to the successful use of the screw box. Once you get this right, everything else is plain sailing. But if the adjustment is ever so slightly off, you will have no end of problems and

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***Graham Blackburn** is a furniture designer/ maker in Soquel, California, and the author of many books on woodworking and home maintenance including* Floors, Walls and Ceilings.

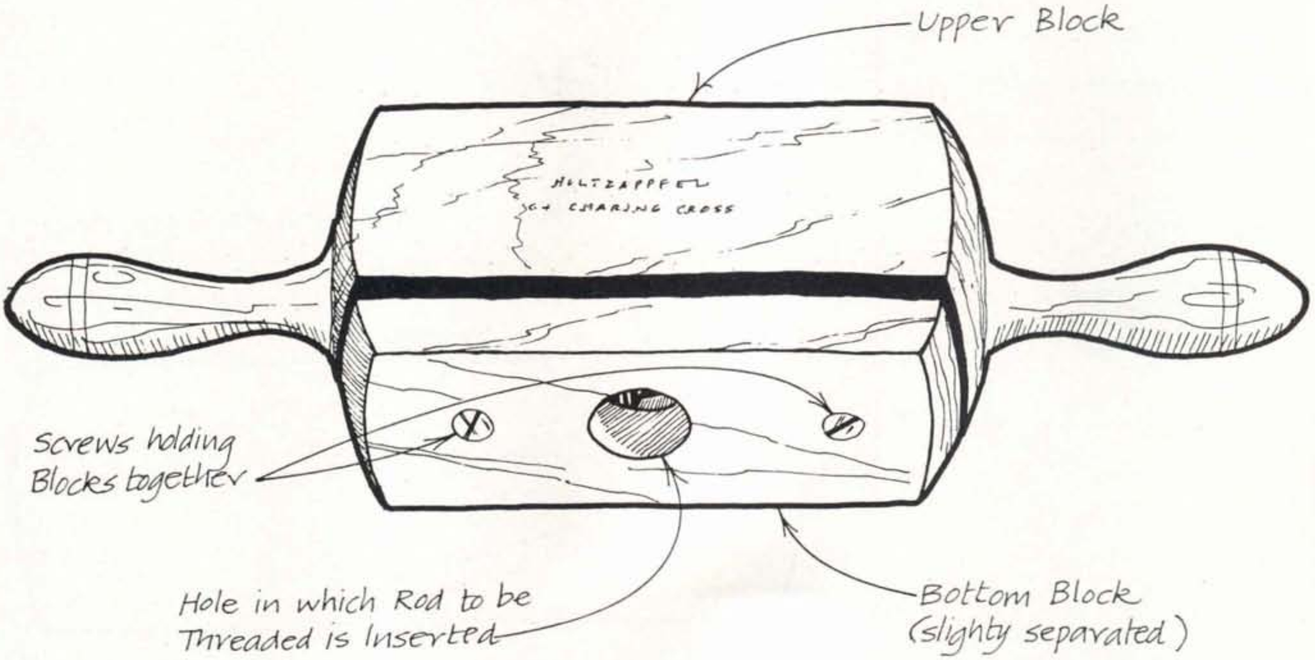

Upper Block
HOLTZAPFFEL
64 CHARING CROSS
Screws holding Blocks together
Hole in which Rod to be Threaded is Inserted
Bottom Block (slighty separated)

Fig. 1 Screw Box

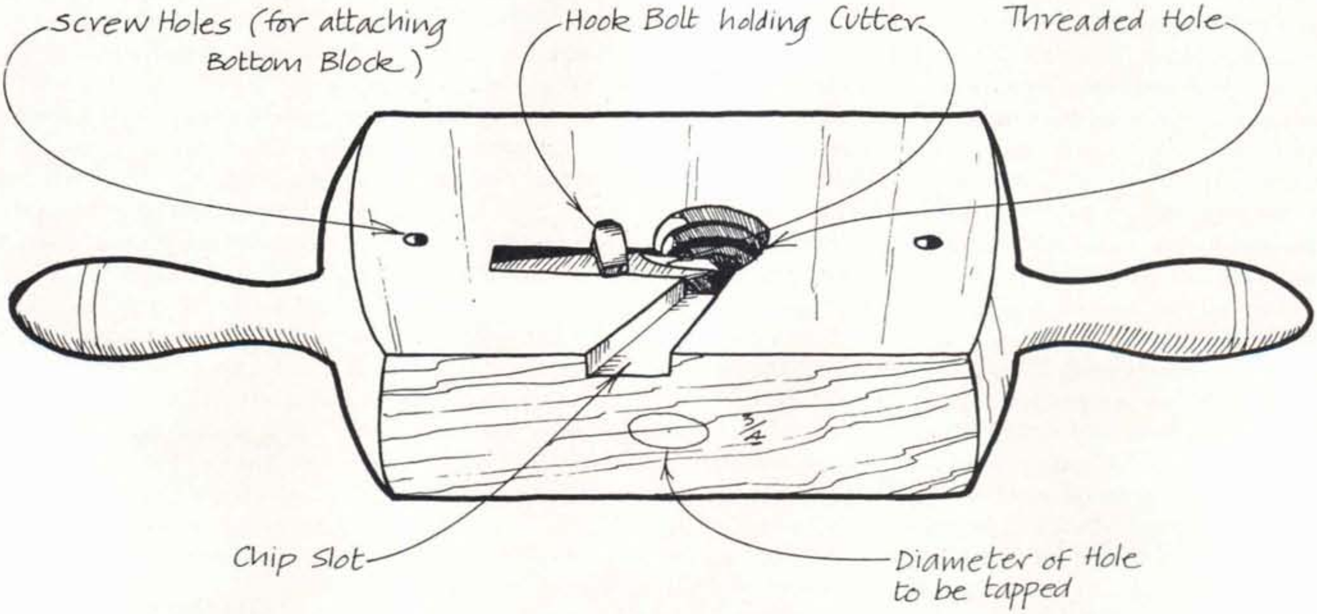
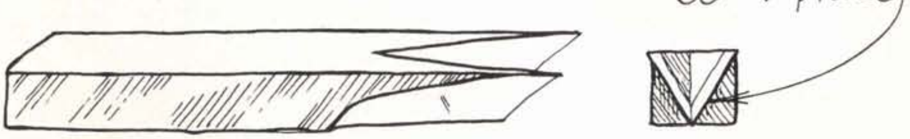

Screw Holes (for attaching Bottom Block)
Hook Bolt holding Cutter
Threaded Hole
3/4
Chip Slot
Diameter of Hole to be tapped

Fig. 2 Upper Block

illustrations by the author

Fig. 3 Screw Box Cutter



Cutting Edge Types

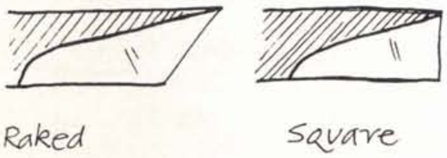
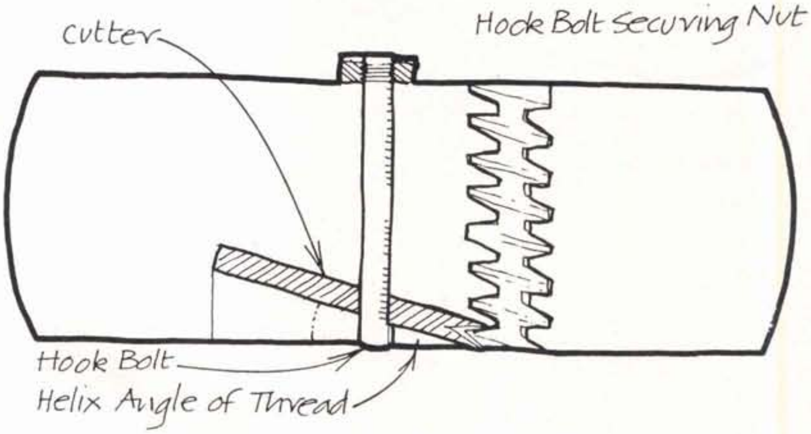


Fig. 4 Section Through Screw Box



probably be (mistakenly) tempted to abandon screw boxes forever as old–fashioned, inefficient junk.

The cutter itself should be made of tool steel sharpened on the inside of a V–shaped edge. Although the end of this edge may be found either square or raked (see Figure 3), the V–profile is invariably formed with a 60° angle. Interestingly enough, this angle is confirmed by modern computer analysis as being the best general purpose angle, though there is no telling how the old makers arrived at the same conclusion; a process of trial and error would surely have left a trail of less successful angles behind.

For this 60° raked or square cutter to work properly and easily, it must be held in position so as to conform with the critical angles. The first demands that the cutter be properly aligned with the **helix angle** of the thread—the axial angle that matches the thread pitch (see Figure 4). Unless the mortise that the cutter sits in has been badly damaged and enlarged by use or abuse, this angle should have been properly provided for in manufacture.

The second critical angle is also largely governed by this mortise but allows for user adjustment. It is the angle at which the cutter forms a tangent to the circumference of the rod being threaded (see Figure 5). Assuming this angle to be correct, all the user has to do is correctly set the cutter's depth so that its point is exactly at the bottom of the required **minor thread diameter** (the bottom of the thread). In use, it is the cutter which defines this dimension.

If the cutter's tangential angle is too deep, the cutter will dig in and jam; if it is too high, it may not cut at all.

Recognizing which adjustments need to be made and to what degree becomes easier with a little practice at thread cutting. It is ignorance of these various possibilities that can make a poorly adjusted tool·seem like an exercise in frustration.

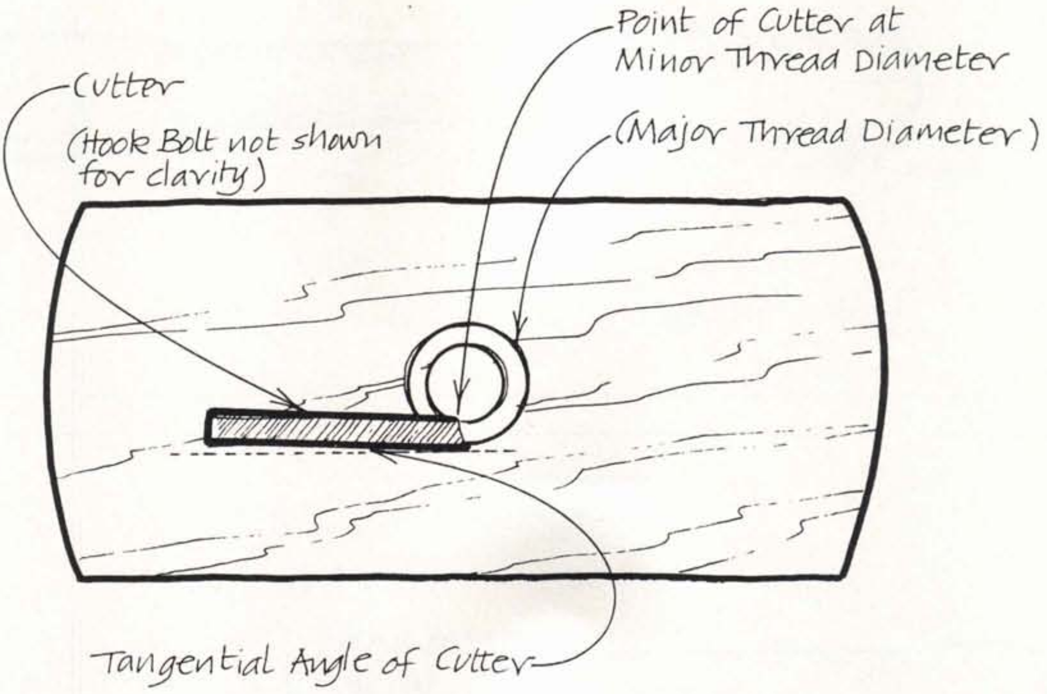
Having described the critical relationships which must exist between the cutter and the threaded hole in the upper block, it should also be pointed out that the ways in which the correct adjustment is maintained encompass an amazing variety of techniques. Many commercially made boxes have hook bolts that are tightened by a slotted nut on the bolt where it passes through the outside of the upper block. Homemade methods include screws, nails, wedges, and sometimes just a friction fit in the cutter's mortise.

A useful tip that can help secure a loose cutter is to take a shaving or two off the inside face of the upper block so that the cutter is just a little proud of this surface. Then, when the bottom block is fixed to the upper block, it will press against the cutter and help hold it in position. Be careful that any pressure exerted in this manner does not also inadvertently alter the cutter's helix angle by tipping it in its mortise. Also, this method will not work unless the bottom block is in place—which it will not always be, since when a thread is required to be cut right up to a shoulder, the bottom block must be removed.

The Chip Slot

One other feature of the upper block not to be overlooked is the chip slot, the mouth of the box through which the chips must exit. If this is clogged, it will be

Fig. 5 Tangential Angle



illustrations by the author

difficult, if not impossible, to cut clean threads. The cleaning of this slot, together with adjustment of the cutter and the need to make shoulder cuts, are the main reasons why the bottom block needs to be removable.

Handles

The last, and probably most salient feature of screw boxes—at least of those designed to produce threads in stock that is over 3/4" in diameter—is the furnishing of two integrally turned handles. Smaller boxes are, in fact, just that—boxes, and are designed to be held in the hand or a vise while the rod to be threaded is twisted through them. When working on larger stock, however, it is the stock which is secured in a vise while the screw box is revolved about it, so handles are provided.

Wood Taps

Screw taps are made of steel or forged iron in two main types: channelled or pierced. Both types may be found either straight or tapered. The tapering is to enable the thread to be cut gradually at first, thus reducing the initial force required. Straight taps would appear to be useful for bottomed threads—but a blind hole threaded all the way to the bottom is not a commonly required item in woodworking and probably explains why this type is less common. Since it can require considerable effort to turn a tap in wood, especially for the larger sizes, tapering is a great help.

The tap may be supplied with its own handle secured by a tang or a nut, or as is more usual, with a square or rectangular shank or head designed to allow the tap to be turned by a key, a wrench, or an interchangeable tap handle of the kind commonly used with carpenters' long augers.

The channelled or fluted type (see Figure 6) is the commoner form and usually consists of a slightly tapered tap with three or (most common) four flutes cut through the threads so as to form a series of cutting edges. At the same time, the flutes provide an escape route for the wood removed by the tap.

The second type (see Figure 7) is furnished with a continuous thread. The very first spiral of this thread is pierced by a hole at its start so as to leave a sharpened profile of the thread which then cuts like a little chisel with the waste wood exiting through the hollowed center of the tap.

Threading in Practice

Assuming you are provided with a properly matched set of tap and screw box, it does not matter whether you cut the male or female thread first. When using the tap, the important point is to be sure that you work with a hole bored to the proper diameter. As mentioned before, this is often indicated on the screw box. If it is not, you must measure the minor diameter of the screw and add a little for clearance. If the screw is not yet made, measure the inside diameter of the screw box and add a little. "A little" is necessarily vague, since in practice this depends on a number of factors, such as how large the thread is and how green or dry the material is. A little practical experience will soon make you a good enough judge of this.

If you are using a tapered tap, take care to re–engage the same threads you have already cut each time you reinsert the tap (after having removed it for chip ejection). A certain amount of downward

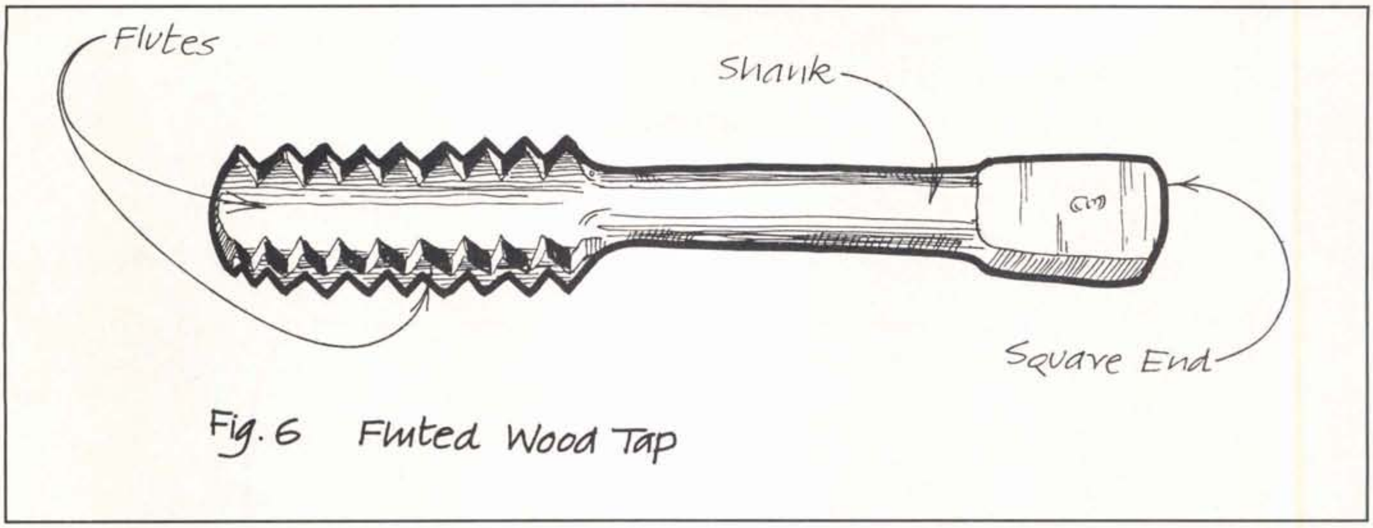


Fig. 6 Fluted Wood Tap

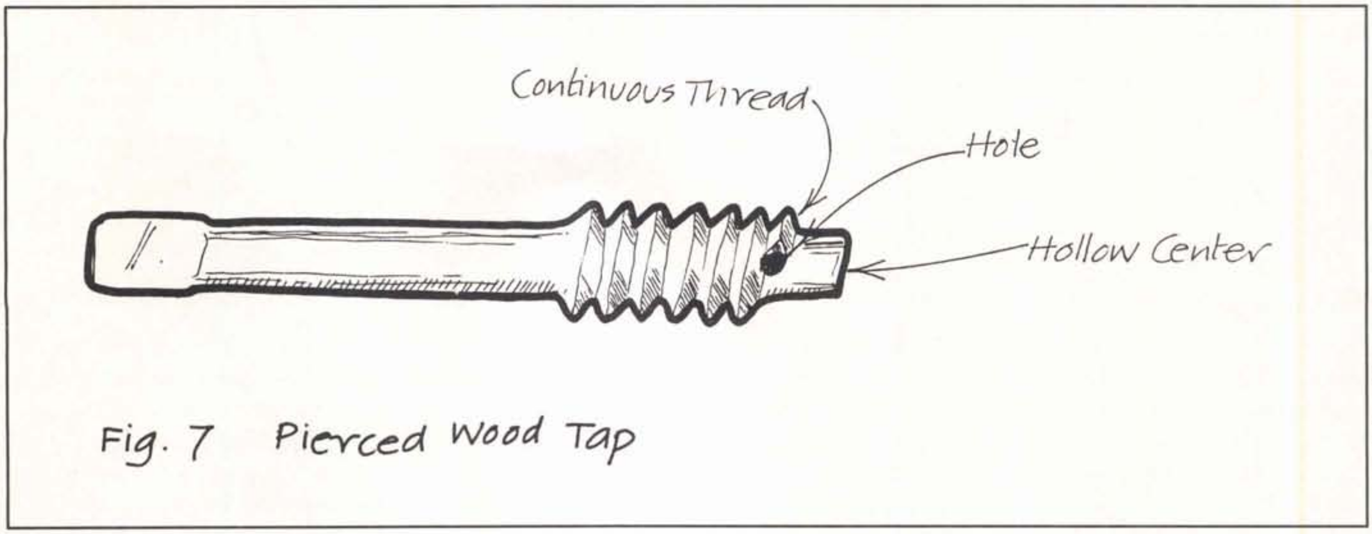


Fig. 7 Pierced Wood Tap

illustrations by the author

pressure is necessary at the beginning to start cutting the threads. If insufficient force is applied, the tap will simply score round and round without biting into the wood. Once begun it should feed itself in, and the only force necessary (which can be considerable, depending on the diameter of the hole being tapped) will be in rotating the tap.

Similarly when using the screw box, it is important to start with a rod or dowel of the correct diameter. It must fit snugly in the unthreaded hole of the bottom block but at the same time turn freely. If you are using stock you have turned yourself or have just made with a dowel–making machine, this is generally no problem. But beware of commercially made dowel rod; it has often dried out–of–round, and is not only smaller than its nominal size but may be oval to boot. It helps to slightly chamfer the end of the rod and feed it forcefully at first into the box until the cutter has taken a bite. Thereafter, the threaded portion of the upper block will ensure that the rod is fed through at the proper rate. To make cutting easier, you may back off the cutter slightly for the first pass and then reset it to cut to the full depth of the thread for the finish cut.

Practically all difficulties will be traceable to an incorrectly set cutter. If it is set too high, you will not be able to make a deep enough cut and the rod will bind on the threaded portion of the box. If the cut appears deep enough but the rod is still hard to turn in the box, then the cutter may be misaligned with regard to the helix angle. One side of the freshly cut thread being polished points to this, and you should reset the cutter in the opposite direction.

If the box turns well, the next thing that may be a problem is the rod itself. Not all species of wood are suited to threads. If the wood is too soft, the cut threads will chip off, or worse, the rod will emerge from the box undersized and furry, with few recognizable threads. Make sure the cutter is sharp and the wood is seasoned, and experiment with different species. Maple, birch, hornbeam, alder, boxwood, and lignum vitae are generally excellent, as are many fruit woods. Hardwoods with porous grain, like the various oaks, are sometimes fine, but their threads can be prone to a lot of chipping. Walnut and beech—from which many commercial dowels are made—are not good choices. Green wood may produce long shavings and good threads but will then shrink to the point where it is too loose a fit. PW

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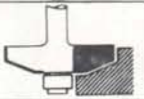	#15	Raised Panel	20° Angle	1-5/8"	1/2"	$25.00
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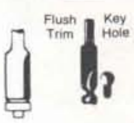 Flush Trim Key Hole	#13	1/2" FLUSH TRIM		1/2"	1"	$ 8.50
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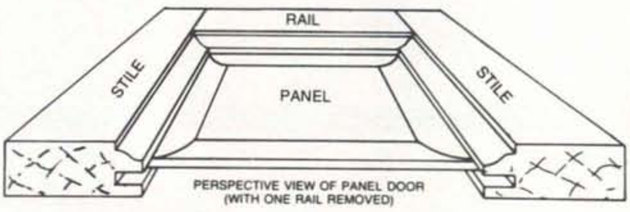

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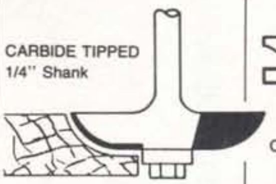

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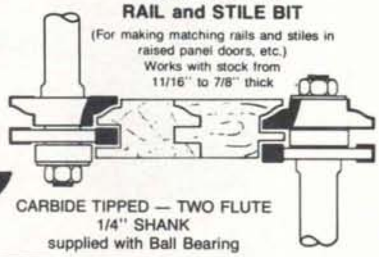

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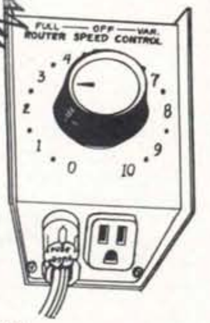

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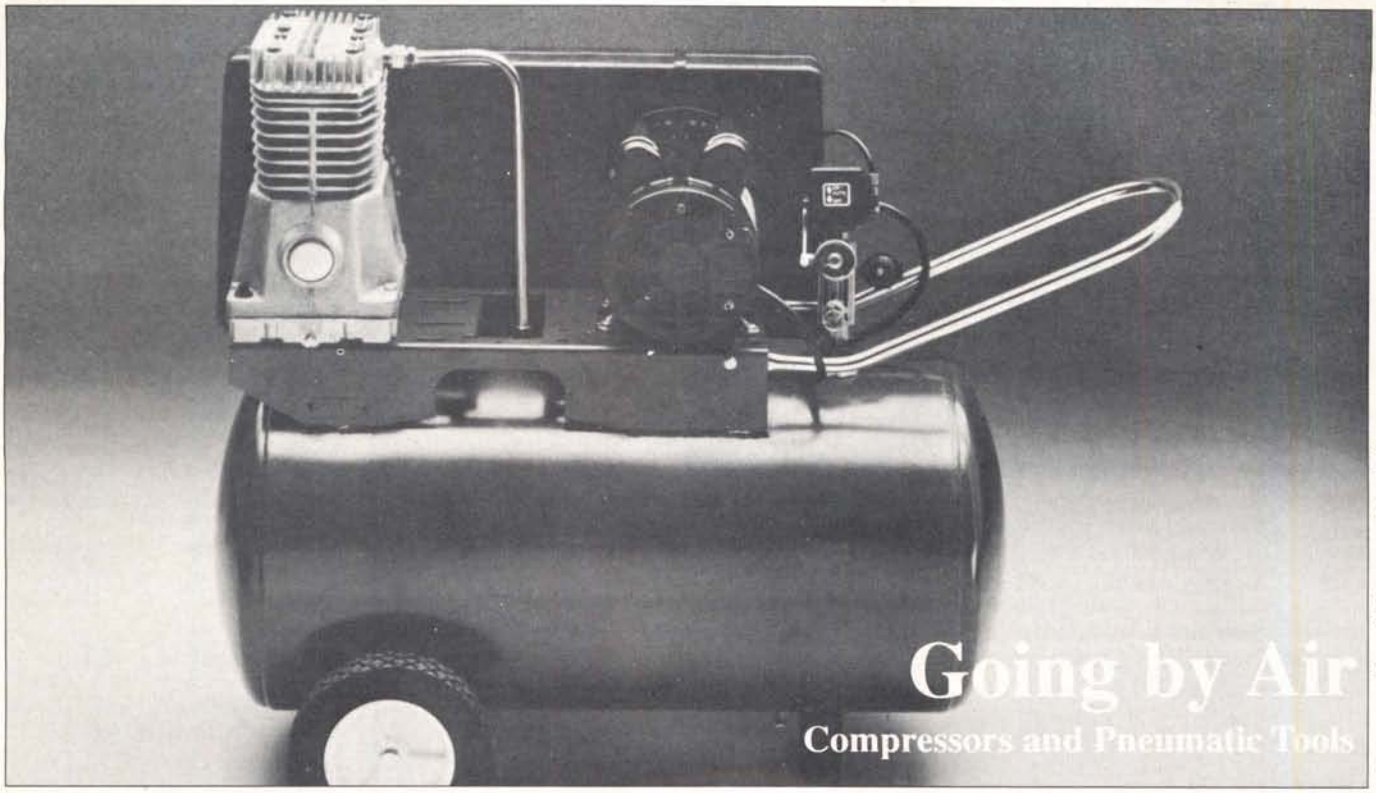

Going by Air

Compressors and Pneumatic Tools

photo courtesy Home Air Compressor Association

by Jeffrey Burr

All of us, whether our shops exist for profit or pleasure, try to get the most out of the budget and space that we have. As a shop grows and develops, we often look for easier and more efficient ways of carrying out the work that we do.

Tools powered by air are one alternative available for woodworkers, and one that allows a new range of choices in the types of tools available. For years compressors were only made with industrial applications in mind, and the cost and size of these compressors made them impractical for a home shop. In recent years, however, smaller "homeowner" compressors have been made and heavily marketed by the industry. These smaller units can be plugged into regular 110–volt outlets, unlike the larger units which run on 220 or 3–phase. They generally run on a 2 to 5 horsepower motor, and can drive a range of tools suitable for light– to medium–duty work. For the woodworker, pneumatic tools can be an attractive alternative to their electric counterparts. There are some basics, however, that you should know before jumping in that may save you lots of time and money in the long run.

Most of us have seen a mechanic use pneumatic tools on our car. Air–driven wrenches have been the standard power tool for this work for years, with electric wrenches only recently coming on the scene. Those who work near water, such as in boat repair, may appreciate air tools because of the lack of risk from electric shock. There are some who swear by these tools above all others, reporting that pneumatic tools are faster, stronger, cleaner and longer lasting than their electric counterparts. In one sense, when you buy a compressor and pneumatic tools, you are buying one motor instead of many, with that many fewer moving parts to wear out. It's almost as if you were buying one motor and a bunch of "bits" rather than tools.

The subject of pneumatic tools is a wide and varied field with as many different options as in the entire field of electric power tools. This makes the seemingly simple question of whether to go this route a very complex issue, and one not easily answered. Generally speaking, the answer will depend on a few of facts: what kind of work you do, what kind of tools you use, and how much and how fast you need to use them. The place to start is with the tools, and for a good reason. Tools are what this is all about; a compressor without them obviously will do no good at all. But there's more than that. When you shop for a stereo system, a salesman will often tell you to first decide on the speakers, and then get a system to hook them up to. When shopping for a computer, the common wisdom is that you should first find the software you need and then buy a computer that will run it. This "bottom end up" approach also applies when you're deciding which compressor to buy; first figure out which tools you need, then find a compressor to run them.

One of the reasons for this is that every compressor will not run every pneumatic tool. Compressors range from huge, expensive models which will run practically everything (and more than one at the same time), to small, tankless models which will run only a very small range of items. To get a grip on this, let's take a brief look at compressors in general, starting with the simplest models.

Anatomy of a Compressor

A compressor is basically a way of delivering air—very quickly and under pressure—to a tool of some sort. It does this using either a piston–driven pump (most common) or a rubber diaphragm pump, both of which drive air into a hose leading to the tool. There are some models

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Jeffrey Burr is associate editor of Popular Woodworking .

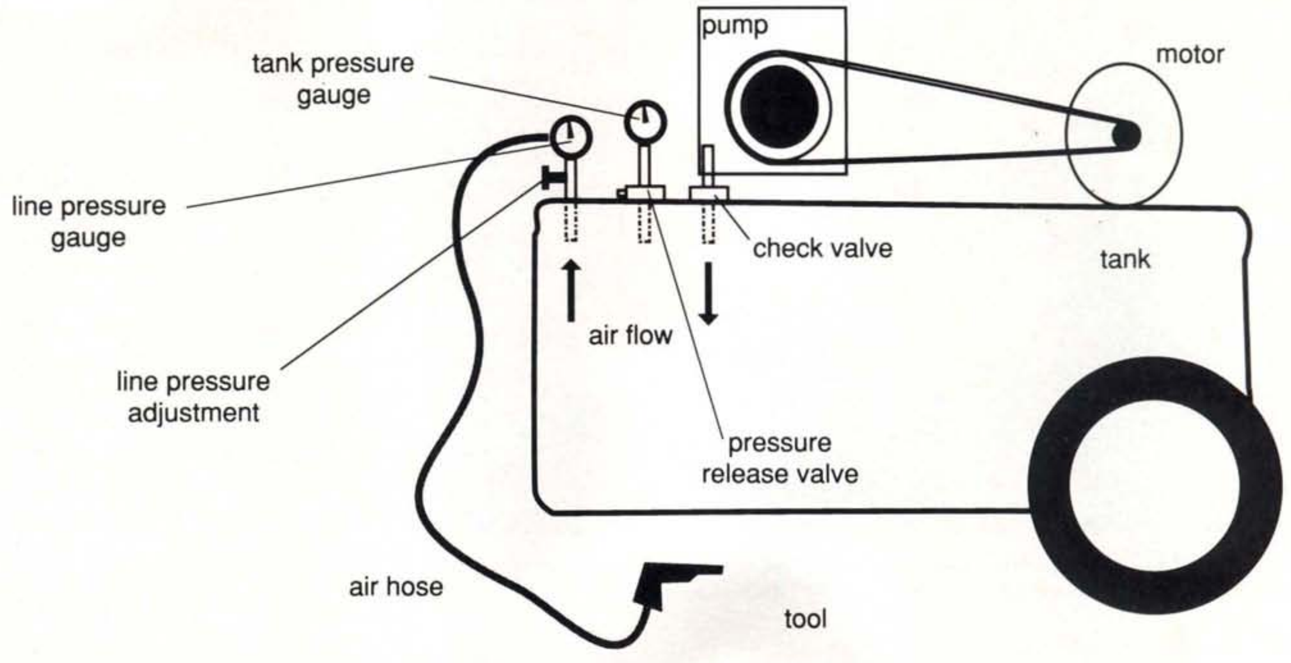


Figure 1. Basic Components of a Compressor

Illustration by the author

with and some without a storage tank, which stores up a reserve of compressed air and is refilled as needed by the pump. On compressors with tanks (which is most of them), there are a number of devices to regulate the flow of air, including safety valves which keep air pressure from rising above a certain point. Compressors are made which run on electric– or gasoline–powered pumps, and in a variety of sizes. Figure 1 shows the basic components of a compressor.

Technical Stuff

The basic unit of measurement for compressors is cubic feet per minute (CFM) and pounds per square inch (PSI). CFM is a measure of the *speed* at which a certain volume of air is delivered by a compressor. This figure will change depending on the PSI at which the compressor is running, so compressors are usually rated at so many CFM at so many PSI. A machine rated at, say, 8.6 CFM at 40 PSI means that the machine can put air back in the tank fast enough to keep the pressure at 40 PSI even when it's leaving the tank at 5.5 cubic feet per minute.

Here's another way of looking at it. On a lot of compressors there are two gauges, one for the tank and one for the hose line to the tool. You can adjust the line pressure (the pressure actually going to the tool) by turning a dial, changing it from 40 PSI, say, to 80 PSI. Well, if you run a tool continuously, and change the pressure on the line, you can watch the pressure in the tank go down as it tries to keep up with the air usage. I did this in our shop, running a drill continuously at 60 PSI, and found that the tank could not keep up with the air loss and would eventually run out of air. I found that I had to lower the line pressure to about 40 PSI before the machine would keep up and both dials stay steady. This simply means that with this machine, that drill would have to be run slower than top speed if you wanted to drill for any length of time beyond about 15–second bursts. A basic rule of thumb is that a compressor should be rated at 1-1/2 times the CFM at which the tool is rated. A drill rated at 5.5 CFM, for instance, needs a compressor at 7.5 or so. Most of the other variables, such as a compressor's tank size, horsepower, and voltage requirements are secondary considerations, since they all combine to produce the CFM/PSI rating which is the crucial thing to know.

Tools

Many tools used by woodworkers are available in pneumatic versions, with wrenches, drills, sanders, staplers, nailers, sprayers, and air–hammers being the most common. They operate on different principles, and this, in turn, affects the way in which each will react to different compressors.

Sprayers

The simplest and the most commonly used class of air tools are sprayers. These are used for painting and sandblasting, and all operate on the same basic principle. A jet of air is forced into a spray gun, where it is directed at (or over) a liquid, which is **atomized** (dispersed into tiny particles) by the rush of air, and forced out of the tip of the gun. Paint sprayers are the most commonly used form of these. Sandblasters are another version in which air is used to force sand (which already exists as tiny particles) out of the gun and onto a surface at very high speed. Perhaps the simplest version of this kind of tool is the blow gun, which uses forced air to create a jet that draws outside air through the tip and into a high–powered stream. These tools all use a small, continuous supply of air. They can be run on a relatively small compressor, although one with a tank is needed. These tools aren't as sensitive to variations in pressure as a drill might be, which means they can be run on a compressor that has relatively long air–replacement time. A sprayer can be useful for a woodworker to spray on finishes; lacquer in particular is best

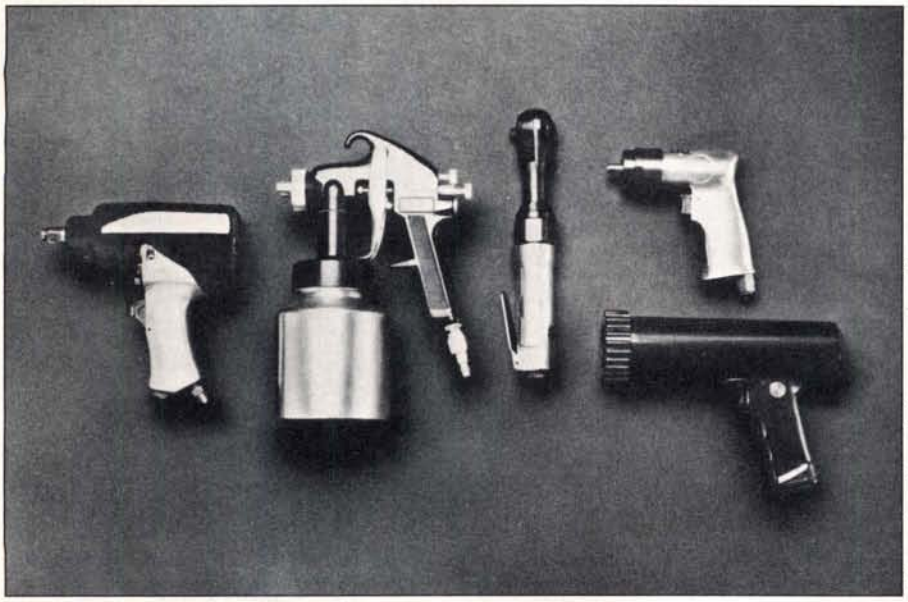


photo courtesy Home Air Compressor Association

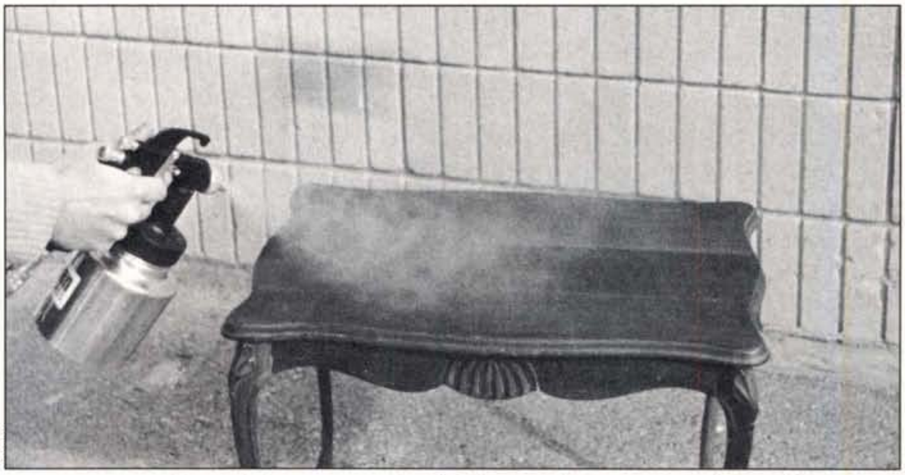
A range of tools is available for the small compressor. Left to right: an impact wrench (heavy–duty), a paint sprayer, a ratchet wrench, a 3/8" drill, and an air gun.

sprayed on. Air brushes are another version of this sort of tool, with a much finer spray which is under more exact control. Varied paint effects such as those used in reproductions of antique furniture can be created with an air brush.

Intermittent Tools

The next category of tools is the intermittent–burst type, usually operated by a piston in the tool body. Nailers and staplers fall into this category, and use a burst of air to shoot staples and nails at high speeds. This is the most common use of compressors for construction. Nailers have gained widespread use in this field, replacing hammers in many applications that require driving large amounts of nails quickly, such as nailing off plywood floors and walls. These tools have also made nailing into concrete and brick a less complex affair, since a high–powered nail gun can easily shoot specially made nails into these materials. With these tools, the type, usage, and duty–rating of the tool determines the kind of compressor needed to run them; a light–duty stapler requires much less power from the compressor than a heavy–duty nail gun. Expect to spend *quite a bit more* for a compressor to run a nail gun all day than for one that will run a stapler now and then. For either a construction crew or a large–volume cabinet shop, nailers make a lot of sense. For a smaller operation, the outlay might be prohibitive. Nailers are made in an enormous variety, in many weights and sizes.

Also included in this piston–driven category are air hammers. These devices use a pulse of air to drive a piston that can drive nails at anywhere from one to 30 blows per minute, at great force. While these are undoubtedly handy for hard–to–reach places and high volume nailing, they also will not run on just any compressor, and a compressor used to drive them should be checked to see if it has the power for the job. A straight–line sander is also a piston–driven tool. This is a tool originally developed for automotive work, but one which can be extremely useful in woodworking as an alternative to belt sanders and orbital sanders.



author

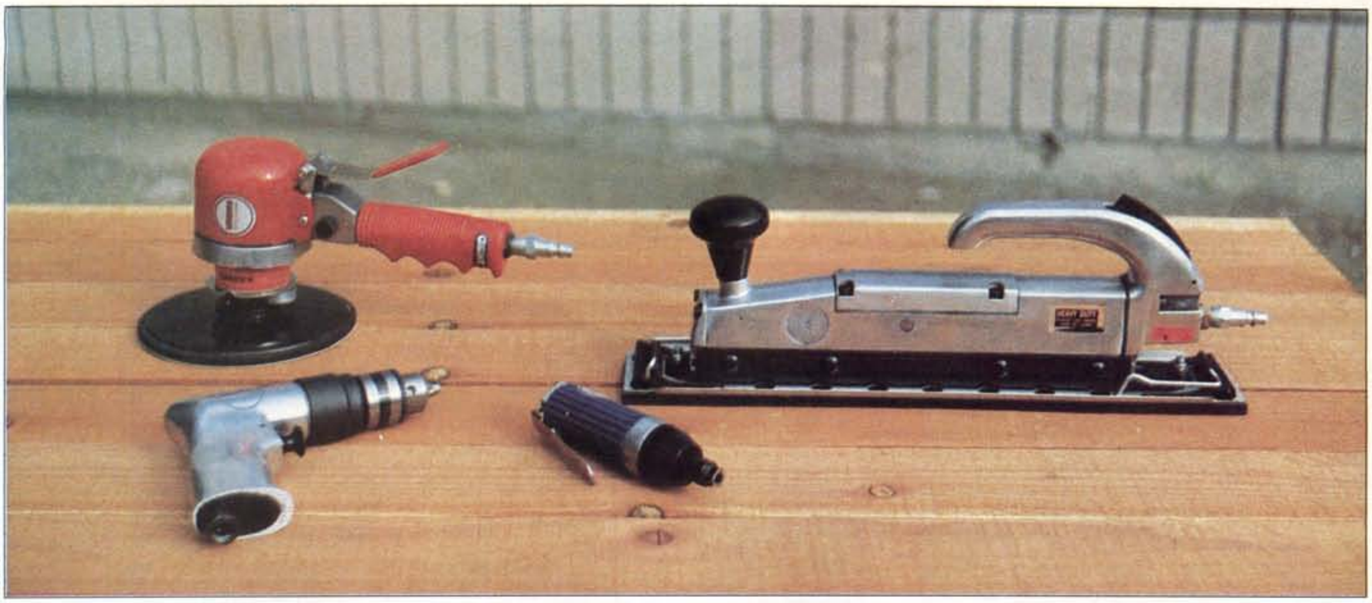
Varnish, lacquer or other finishes can be sprayed on with a paint sprayer.

Turbines

Next are tools that use turbine motors, such as orbital sanders and drills. These tools operate on a continuous stream of air which spins a turbine which, in turn, runs the tool. These tools are generally faster, stronger, and quieter than electric versions, and those who use them swear by them. You can again expect to need at least a medium–sized compressor to handle one of these.

Caulk guns are available that run on air; these can be quite efficient and an improvement on the mechanical types sincethe continuous stream of air keeps a steady flow of caulk coming, to avoid ripples and bulges. For house painting in general, a compressor is a supremely useful item, making it possible to pressure wash old paint off walls, to clean gutters and walls prior to painting, and to run a spray painting rig.

In general, a medium size compressor will supply you with enough air to run most tools on a somewhat steady basis. I tested a number of tools, using a 3 hp, 115–volt 22 gal. compressor rated at 8.6 CFM at 40 PSI that sells for under $500. A 1/4" drill worked well in short bursts, running at its recommended 90 PSI, but when run continuously the compressor could only keep the pressure at about 40 PSI. A straight–line sander rated at 90 PSI ran continuously at that rating with the compressor keeping up just fine. You could conceivably sand all day with this combination. The same was true with a small grinder. These tools all seemed faster, stronger, and for the most part quieter than electric versions. All in all, I was able to run a range of tools: a small grinder, a straight–line sander, a ratchet wrench, a 1/4" drill, and an orbital sander. Under the conditions and requirements of



author

Shown are some of the pneumatic tools tested by the author. From left to right: an orbital sander, 1/4" drill, grinder and straight–line sander.

most small shop owners, these tools would all function well with a compressor of this size. The only time a medium–size "homeowner" compressor like this one would give you trouble is in trying to run a heavy nailer all day long, or for a lot of heavy–duty drilling in metal. For most woodworking shop applica-tions, however, this setup would perform admirably.

These tools might take some getting used to for one accustomed to electric tools; they are, in general, stronger than their electric counterparts when operating at full pressure, and they start right up at full power, unlike electric tools which take a second to get up to speed. While this "punch" may feel a little different, it is also one of the tools' selling points, making them perfect for removing tight bolts, for instance. Most manufacturers recommend oiling pneumatic tools daily and cite failure to do so as the primary cause of tools wearing out.

Those I spoke to assured me that air compressors are perfectly safe, as long as basic safety rules and instructions are followed. The tank should be protected from damage (things falling on it, for instance) and should not be used if it is damaged. A metal cage makes sense if a compressor is to be installed and left in one place. Tanks should also be drained periodically to prevent rust corrosion from weakening them from the inside. All compressors are heavily regulated and tested, and this procedure should never be circumvented by repairing one yourself or using substitute components as parts.

The most common mistake made by someone buying an air compressor is to buy one that's too small; once they've played with it for a while and find out about all the tools that they would like to run on it, they discover that it won't run half of them. The outlay for a medium–sized compressor will give you the ability to run a variety of woodworking tools that you now run on electricity, and in addition, gives you the ability to paint your house, spray lacquer, sandblast metal, inflate anything that needs inflating, blow sawdust out of tight corners and clean your tools. (This last use should not be underestimated– anyone who has a blow gun knows the value of this item in a woodworking shop.) You can expect to pay around $400–$500 for a compressor that will run these tools. The tools themselves cost on the average about 1-1/2 times what electric tools cost but they are generally quieter, stronger, and longer lasting. Is it worth it? Only a close look at your specific needs and budget will answer that. If you can afford it, air–power can be an attractive alternative for working with wood, and a helpful addition to the shop. PW

A 1/4" air drill can supply more power than electric 1/4" drills.

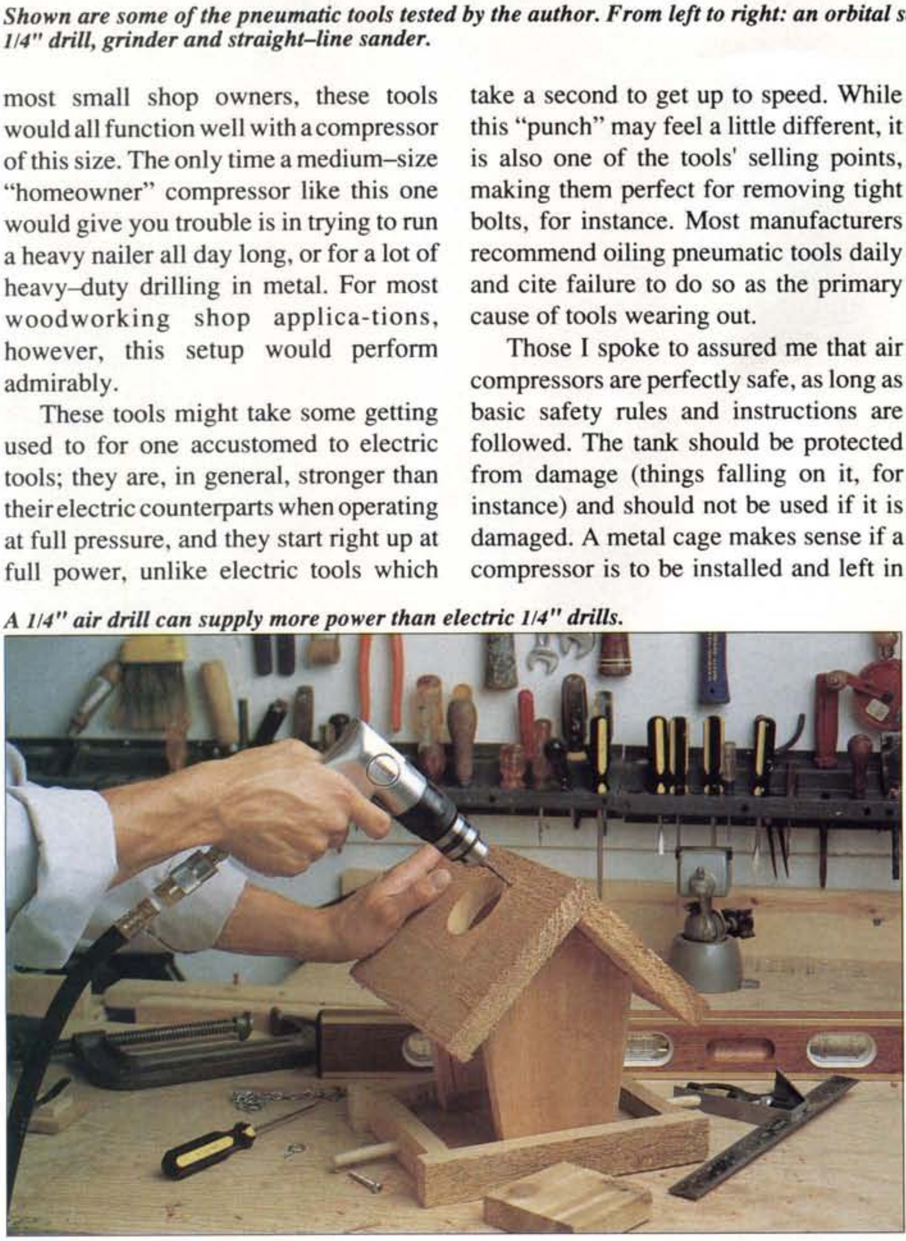
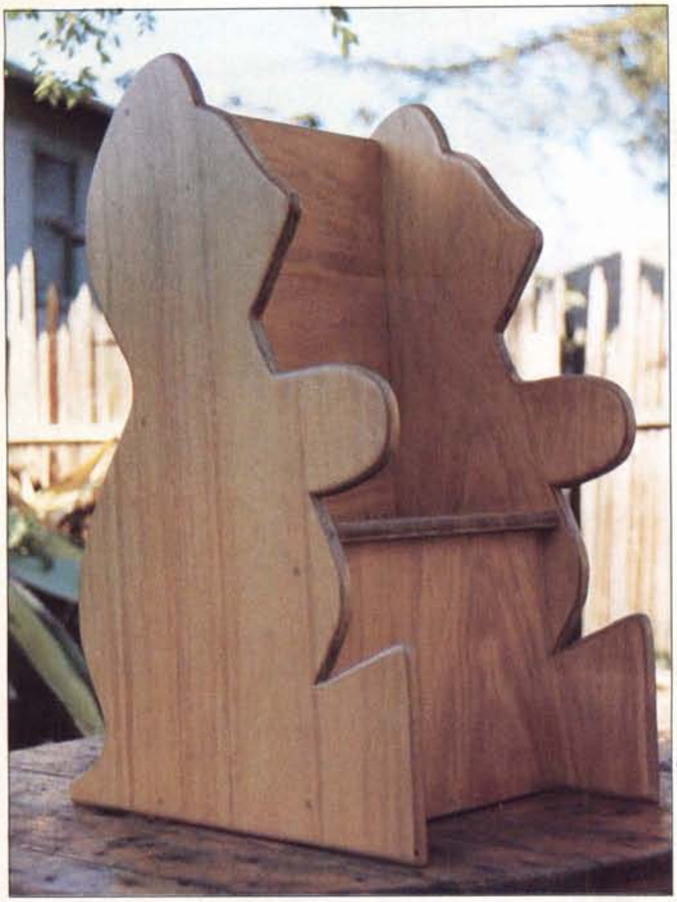
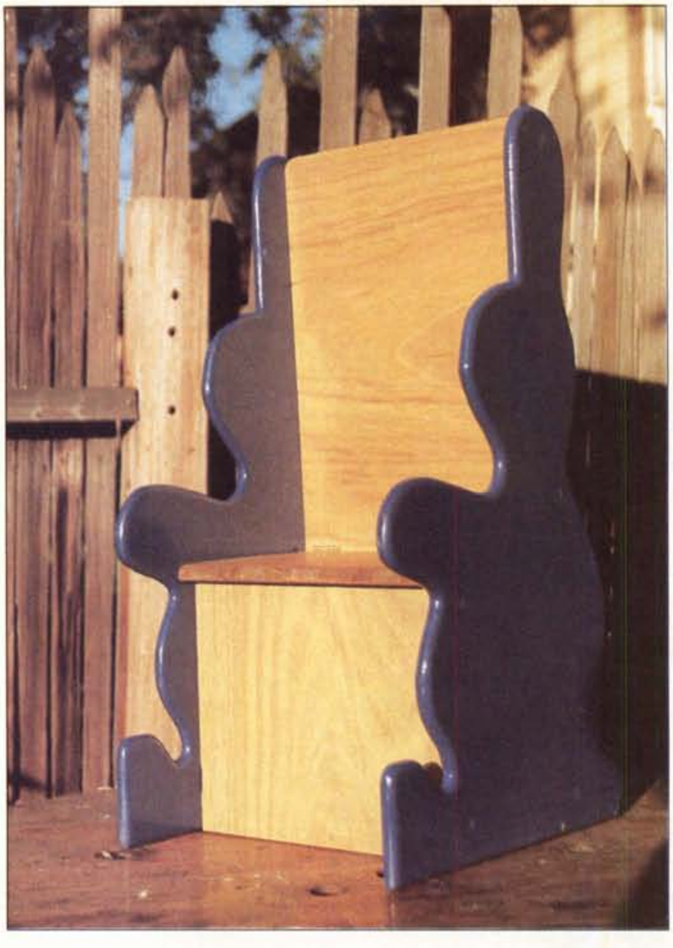


photo courtesy Home Air Compressor Association

Bear Chair & Rabbit Chair





photos by Jeffrey Burr

by Duane Golyer

My little girl loves bears, and so I designed and built this "bear chair" for her, which doubles as a toy box. While I was at it, I made a "rabbit chair" too. These chairs are great beginners' projects. They have a hinged seat that also serves as a lid for a storage box for toys and books. If you like, you can design your own animal shape using this basic design as a starting point. These chairs can be painted or finished with your favorite oil finish or varnish, or any combination of these. The bear chair shown here is finished with tung oil; the rabbit is painted with water-based glossy paint on the sides and finished with tung oil on the other parts.

I made these chairs using Philippine mahogany lumber-core plywood (a plywood with glued–up solid lumber laminated between veneer). This is not carried by every lumber yard, but it can be found if you call around. This wood has a better appearance when routed on the edges than regular plywood. If you decide to paint the entire piece you could use a good grade of regular laminated plywood, since the edges won't show.

Figure 1 shows a layout that will give you the parts for both the bear and rabbit chairs from one piece of 4' × 8' plywood. Make the cuts on the table saw in the order shown. When all pieces are cut square, make the pattern for the animal sides. Using a large piece of paper (you can use butcher paper, or cut and spread out two paper grocery bags and tape them together), draw a grid of 1" squares and transfer the pattern (bear: facing page, rabbit: page 36) onto your paper. If you design your own animal shapes, make sure the height and width are the same as shown, and that the pattern is wide enough to fit the box shape.

Cut out the paper pattern with a pair of scissors, tape it to the surface of one of the side pieces (A), and trace the pattern onto the wood. Attach this piece face to face with the other side, and attach these with brads, with the marked animal shape showing on top. Cut out the pattern using either a jig saw, saber saw, or

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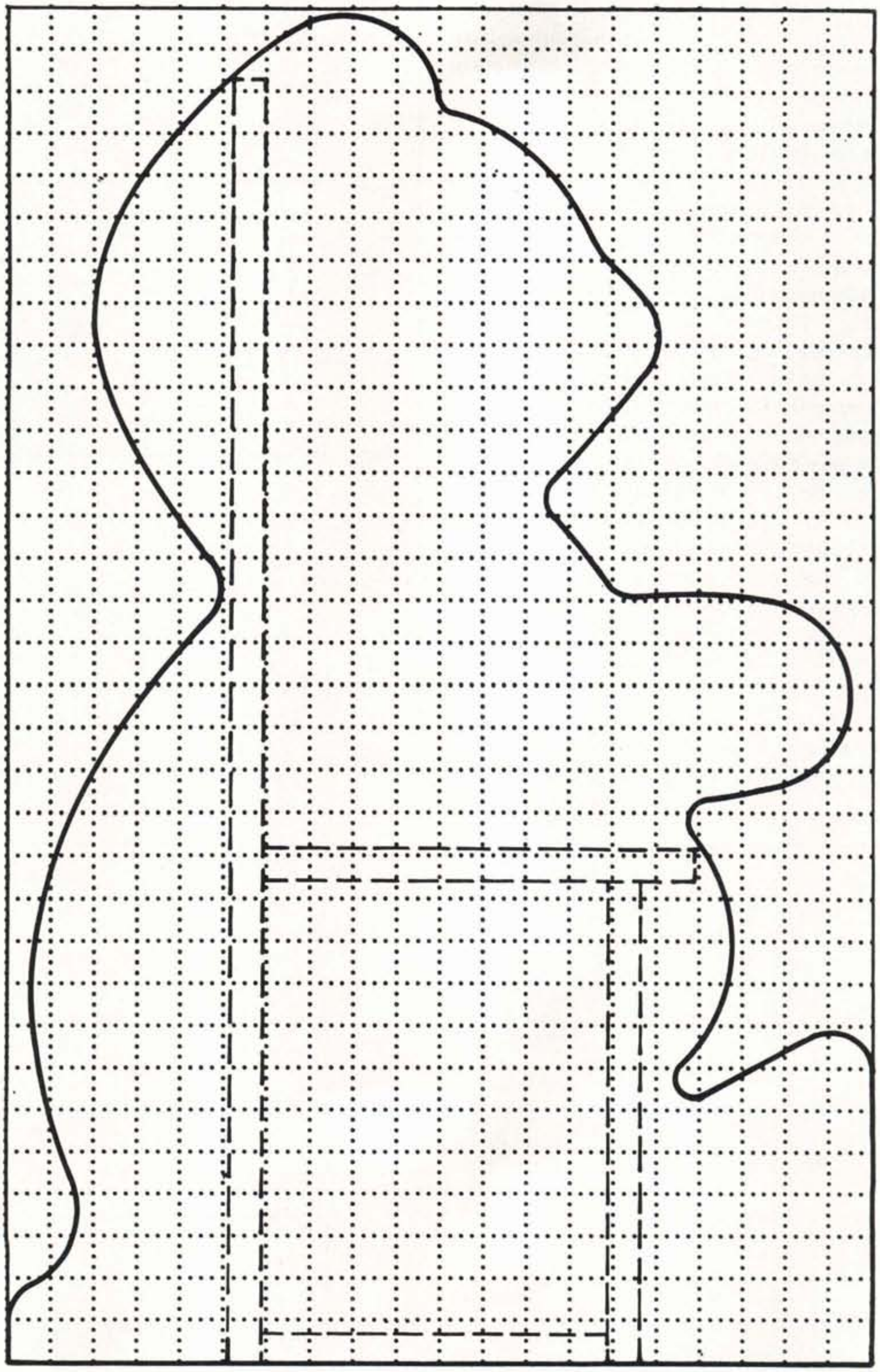
***Duane Golyer** has practiced woodworking as a hobby for the past ten years in Katy, Texas.*

1/4 size pattern for bear chair



illustrations by Tom Larson

band saw, cutting through both pieces at once. Sand the edges with a belt sander or by hand, until you get a smooth outer surface. A drum sander helps with the rounded corners. Separate the pieces, and rout the edges of the two animal–shaped sides using a 1/4" round–over bit. Rout one side with the depth adjusted so that it leaves a wide enough flat spot on the outer edge for the bearing to ride on when you rout the other edge. After both sides are routed, sand the edge smooth. You may have to clean up the tight corners that the router doesn't quite get to by using a chisel or a file. Rout the top outer edge of the seat (B) and both sides of the back's (C) top edge (see Figure 3). Sand all routed edges.While the pieces are still separate, put on the first coat of either sanding sealer, stain (if you want to stain your piece) or primer (if you plan to paint it) and let dry.

Assembly

When all pieces are cut, lay the back (C), bottom (D) and front (E) on their sides, and clamp together so that they form a "J"–shape (see Figure2). After making sure all pieces are square and straight, drill pilot holes for #8 × 1-1/2" drywall screws, and counterbore holes for the screw heads. A combination bit that drills and counterbores at the same time is helpful here. Separate the pieces and glue all surfaces that touch, then reassemble with screws. Next, take this assembly and lay it on top of the animal–shaped side piece (A), positioning it carefully so that the box will be inside the animal profile as shown in the patterns. Follow the same procedure for this assembly, clamping in place, drilling, separating, gluing and screwing the parts together as before. Repeat this process for the other side.

Next, install the hinges and the seat. Mortise slots for the hinges in the back of the seat (B). Install the lid support to keep the lid from falling unexpectedly and causing injury.

Finish the chair with tung oil, varnish or your favorite finish, or paint it with glossy paint. Removing the seat for finishing is helpful. After it dries, give this chair to your favorite little animal lover. PW

illustrations by Tom Larson

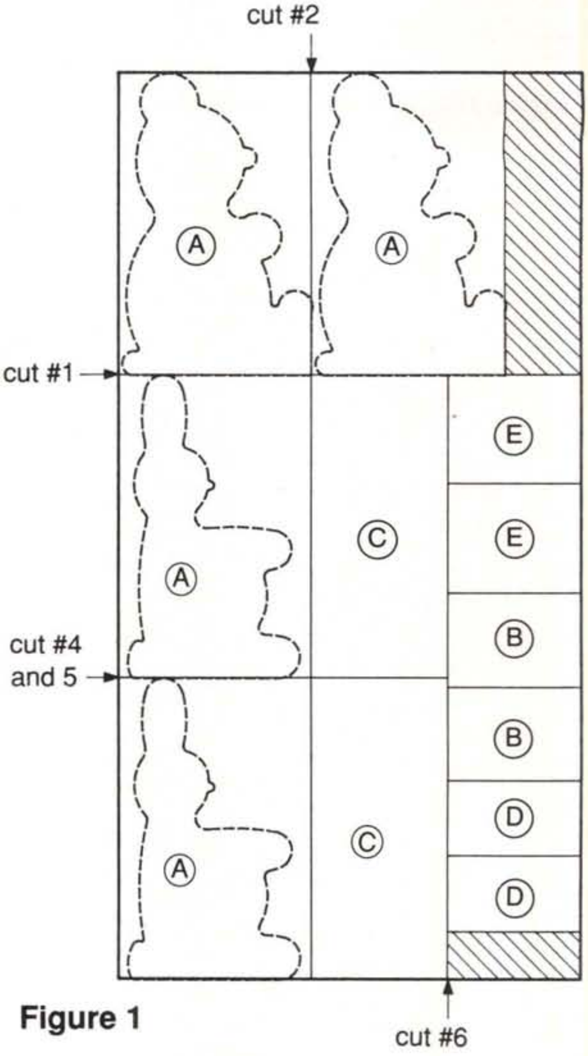


Figure 1

Figure 2

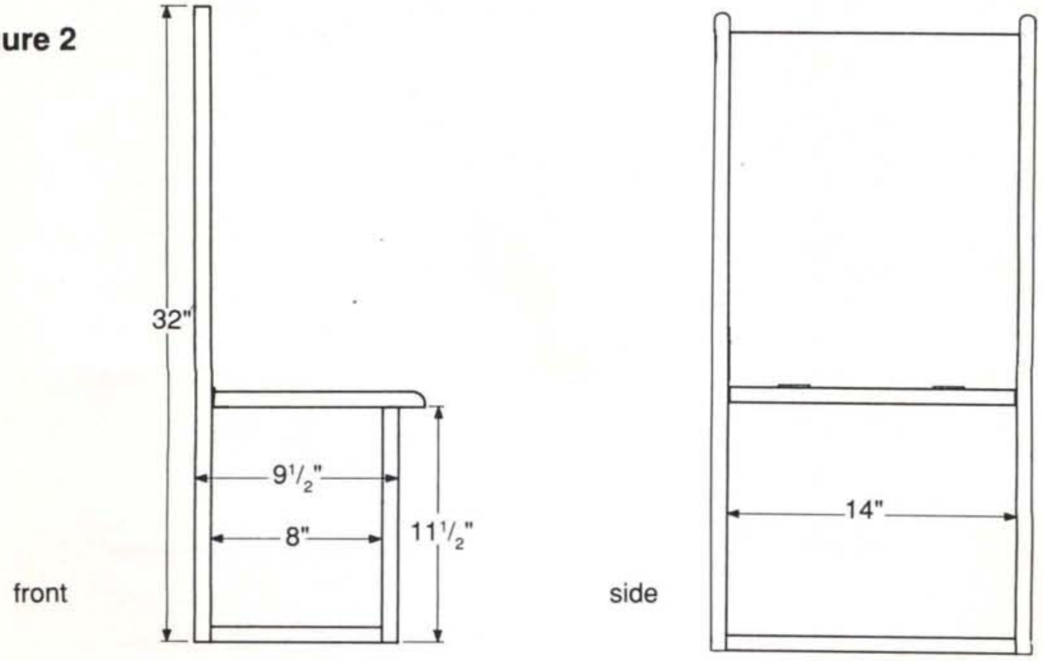
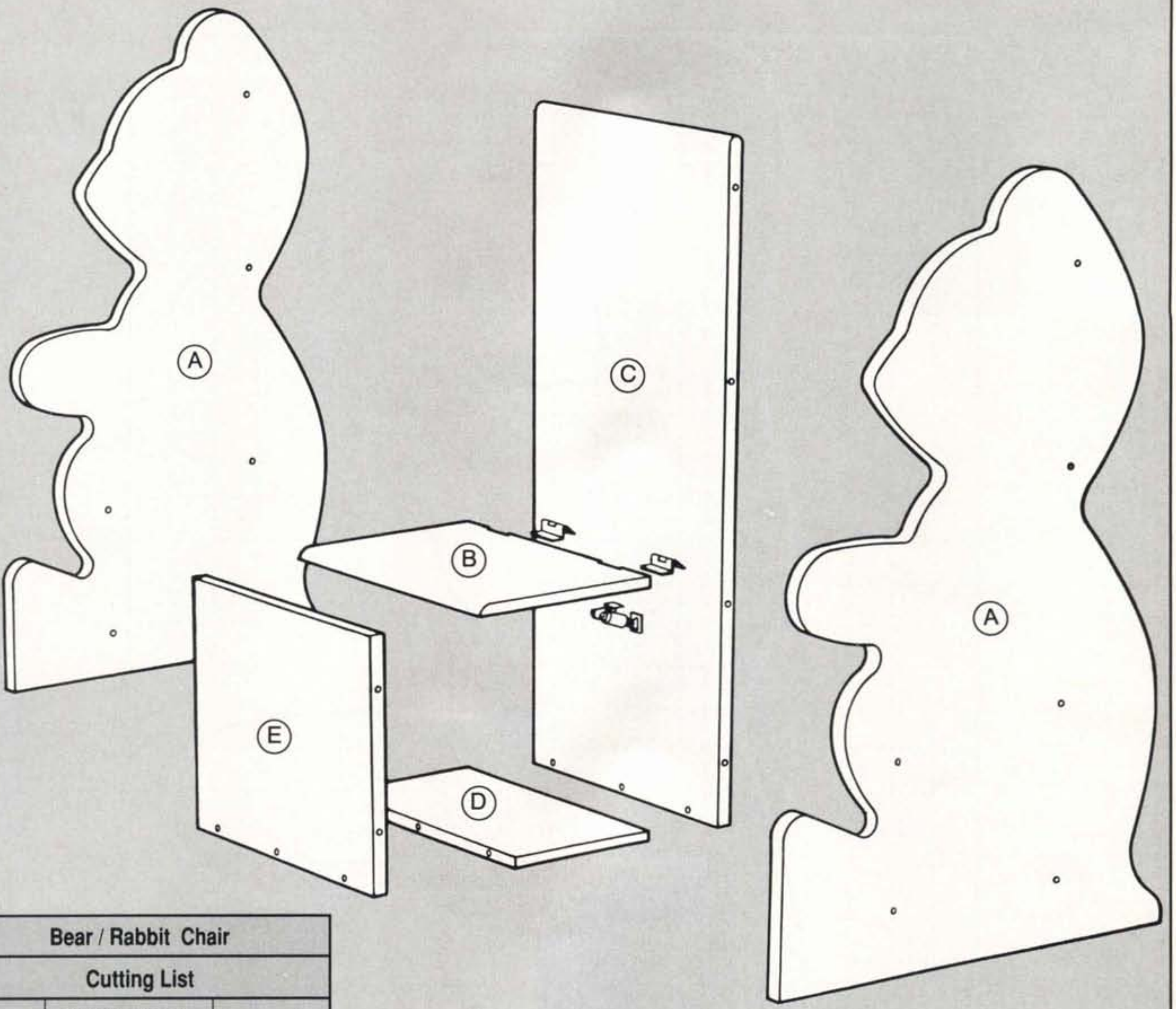


Figure 3



Bear / Rabbit Chair

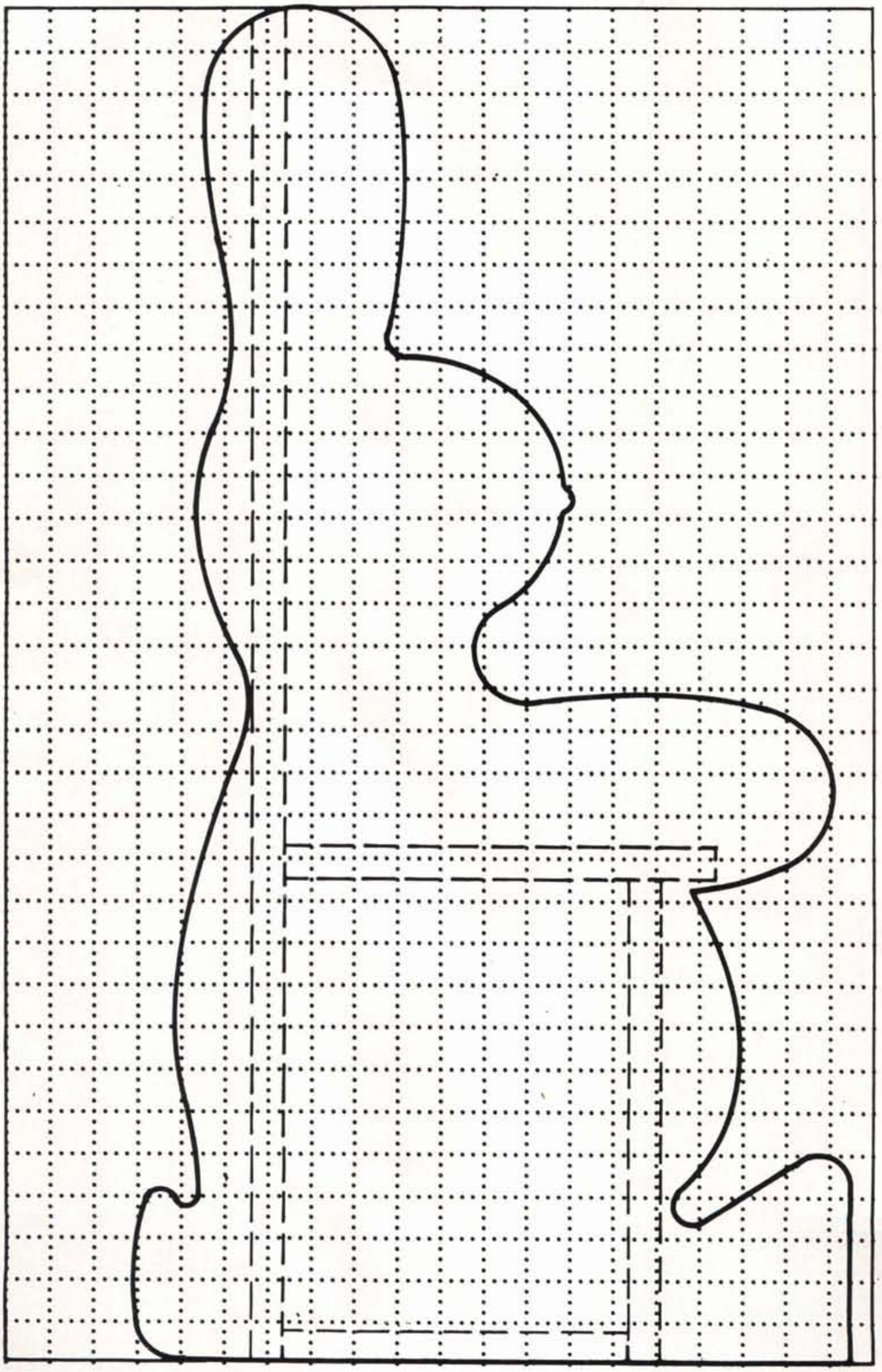
Cutting List

Qty	Part	Finished Size T	W	L	Piece
2	A	3/4"	20"	32"	sides
1	B	3/4"	13 7/8"	10"	seat
1	C	3/4"	14"	32"	back
1	D	3/4"	14"	8"	bottom
1	E	3/4"	14"	11 1/2"	front

Supplies

24	#8 × 1 1/2"drywall screws
2	hinges
1	lid support (Woodworker's Store #D1513)

1/4 size pattern for rabbit chair



illustrations by Tom Larson

PullOut™ Plans

Popular Woodworking #48

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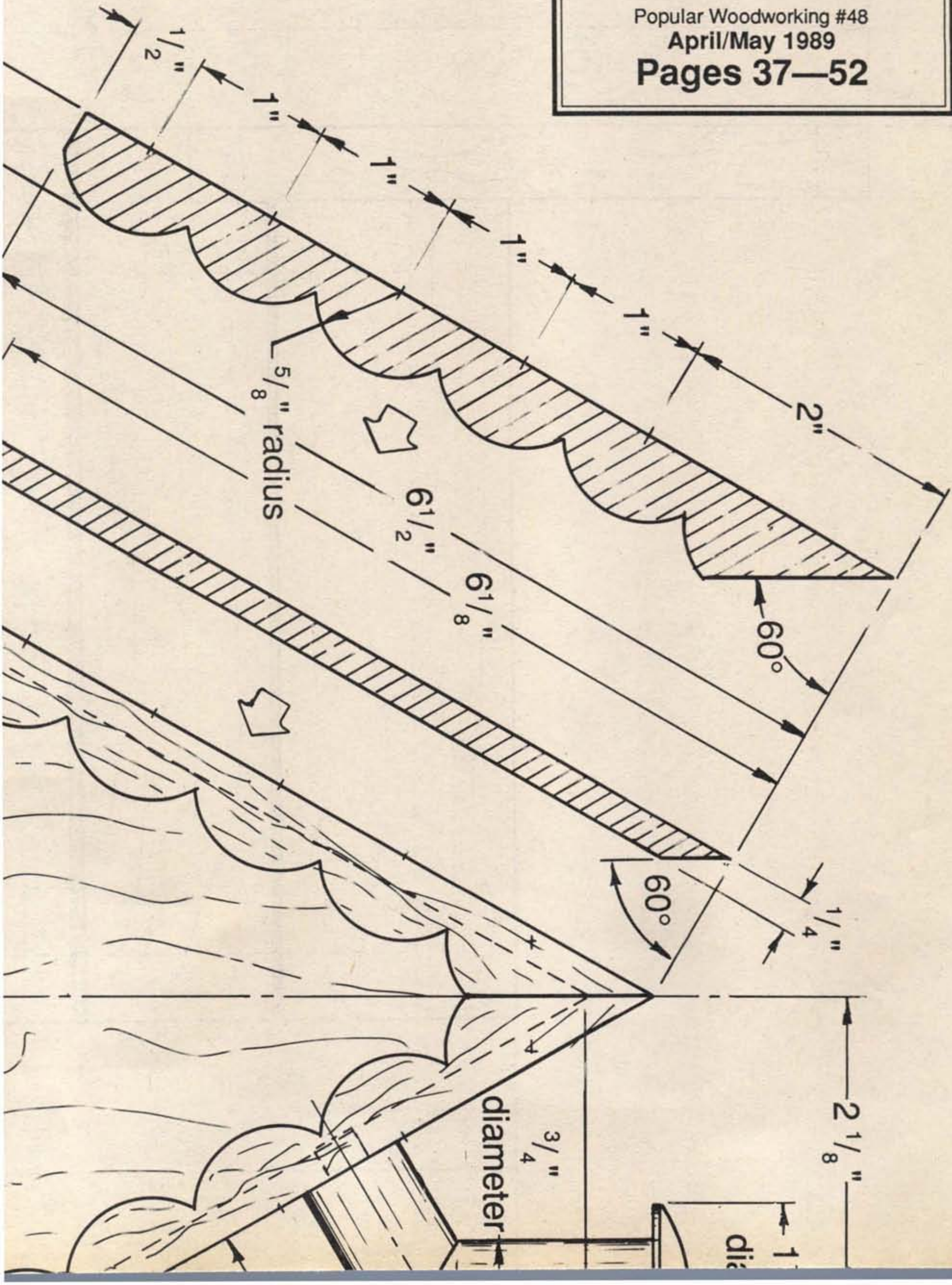
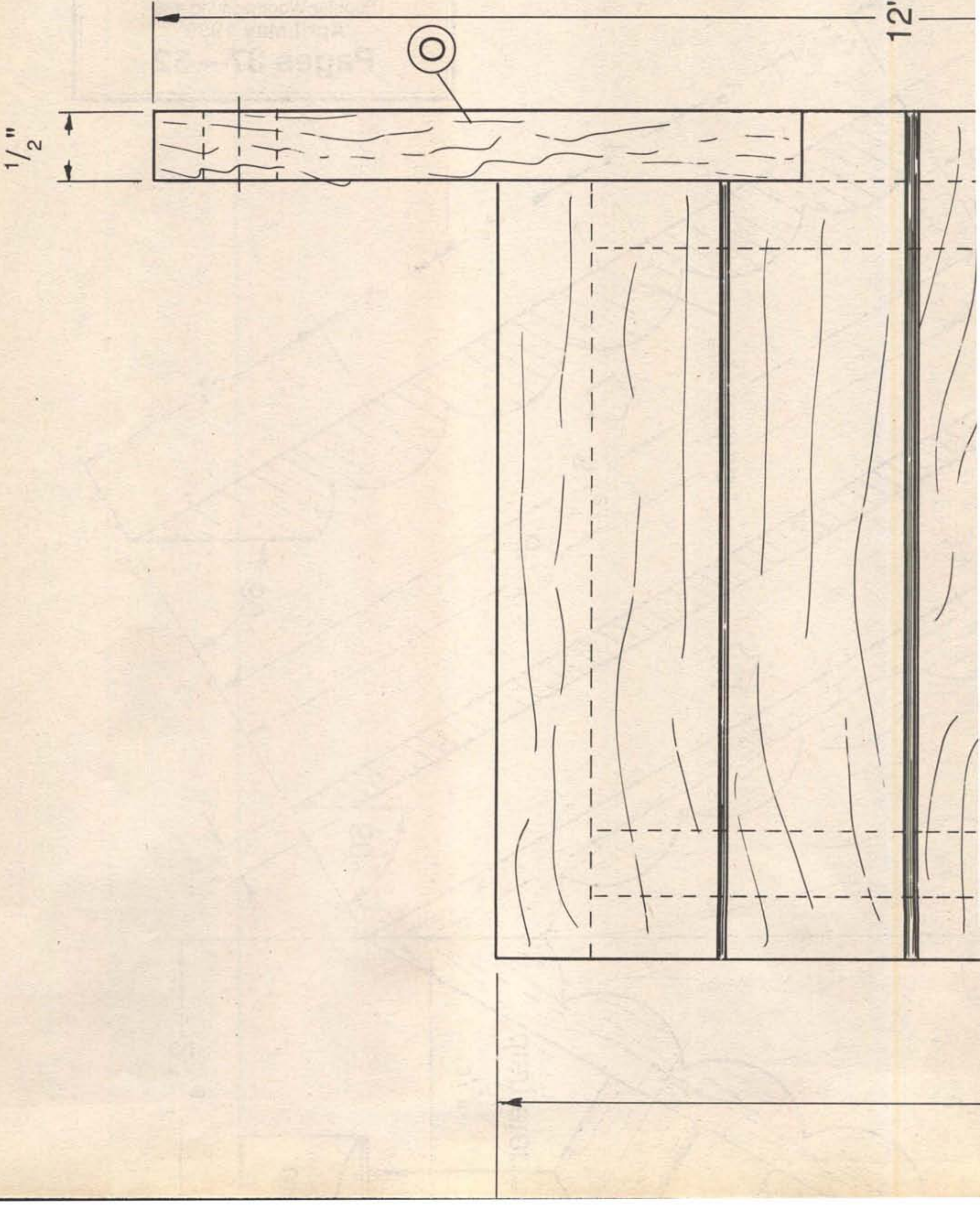
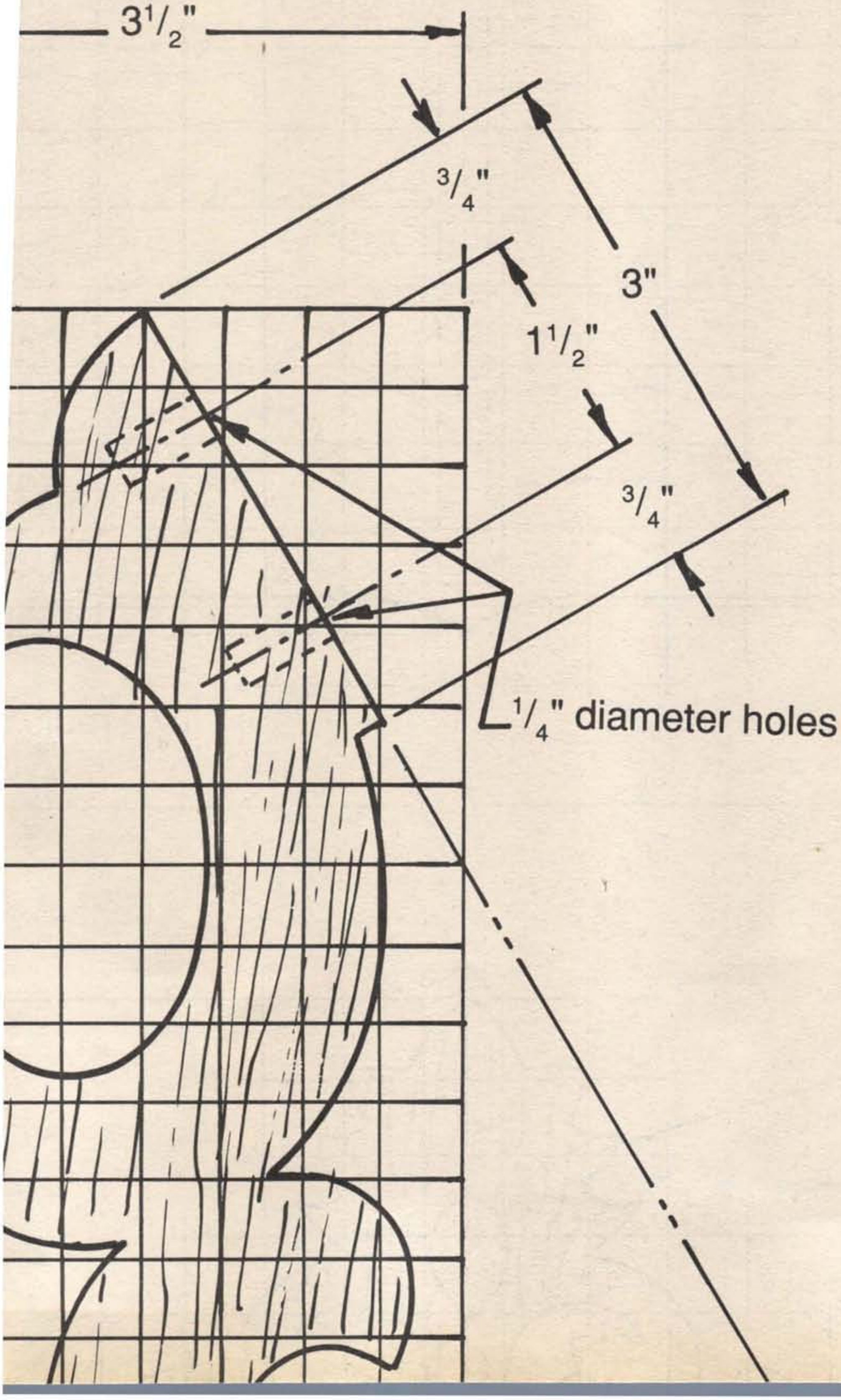
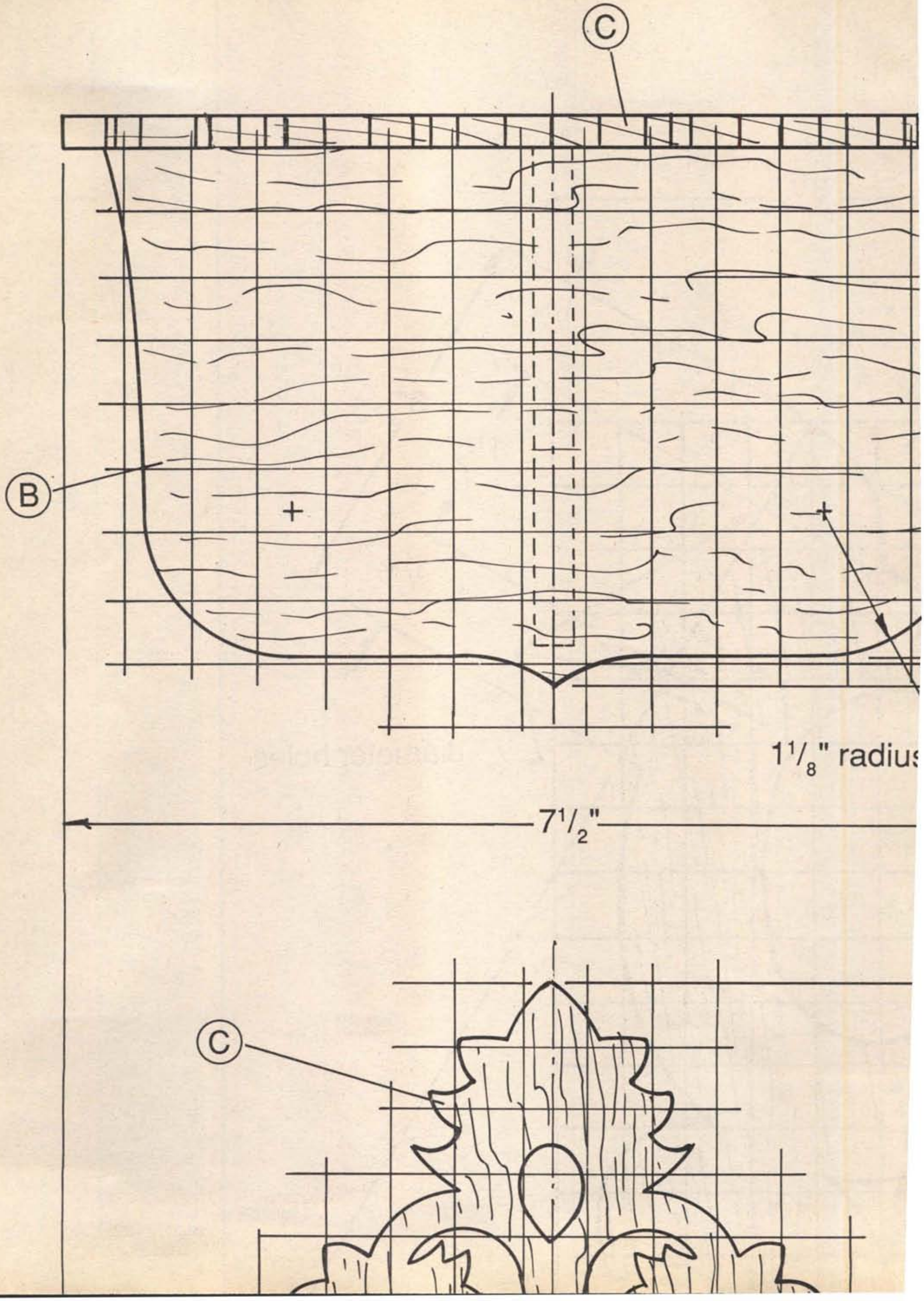
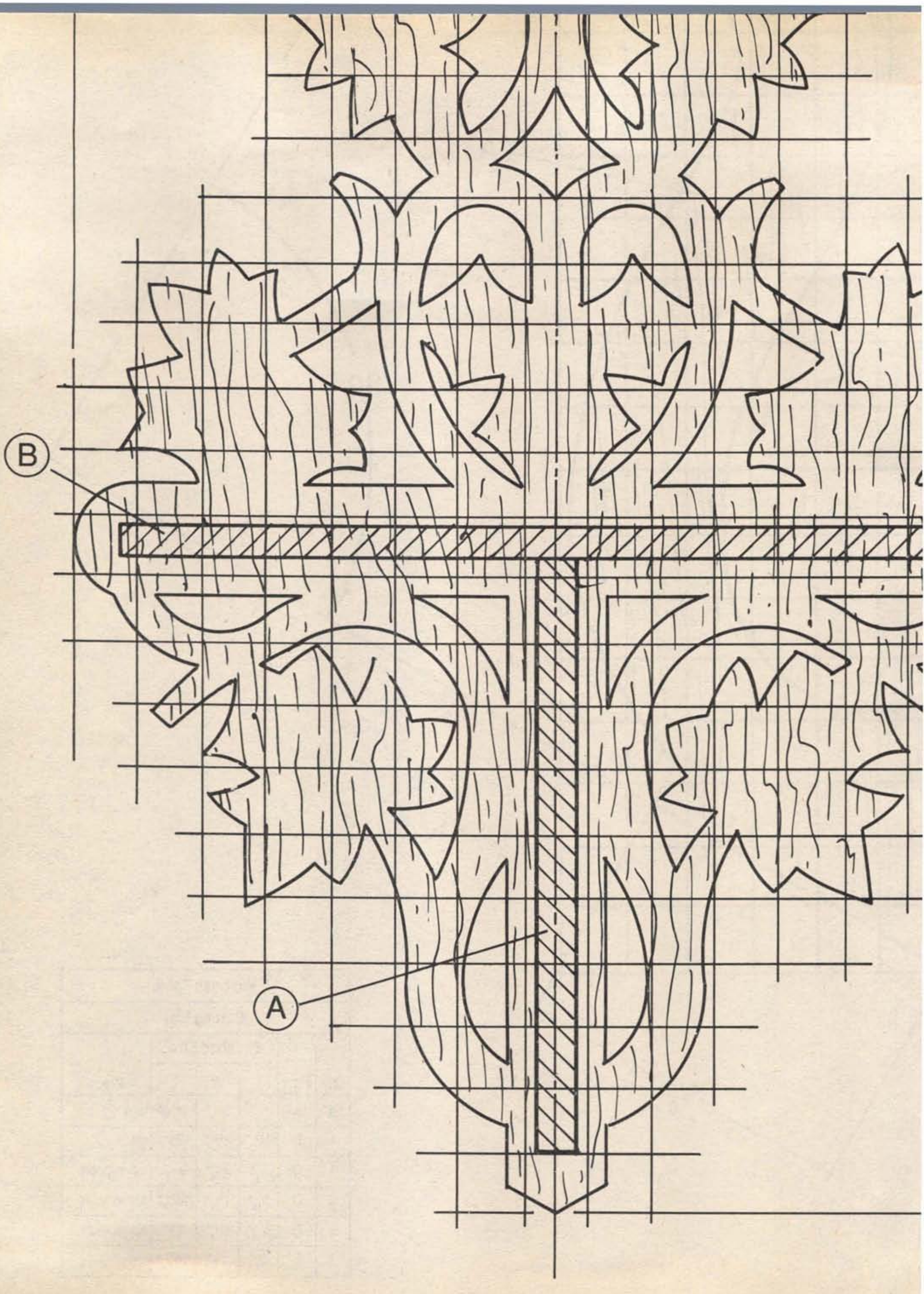
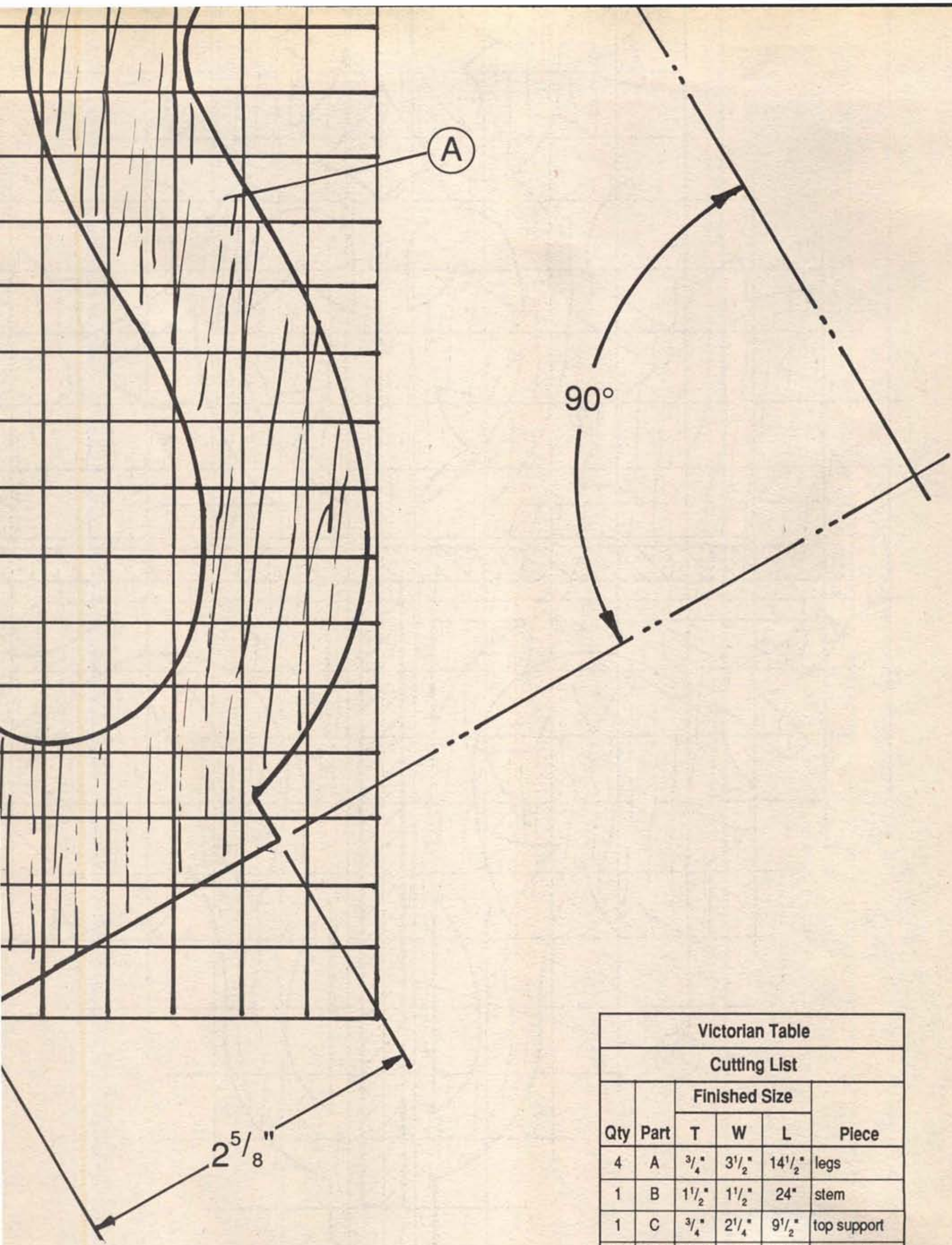



12"
1/2"
O


3 1/2"
3/4"
3"
1 1/2"
3/4"
1/4" diameter holes

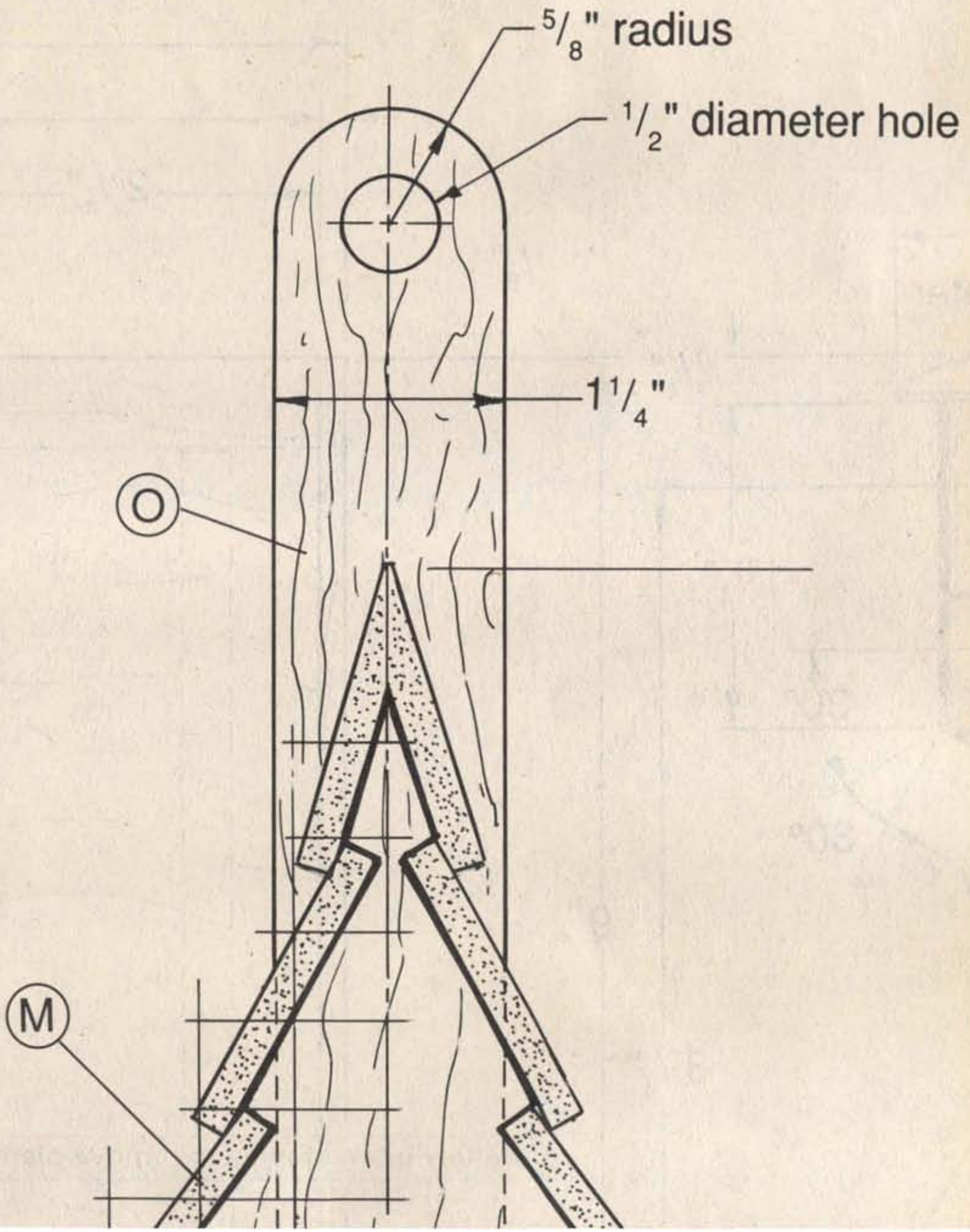

C
B
1$^1/_8$" radius
7$^1/_2$"
C

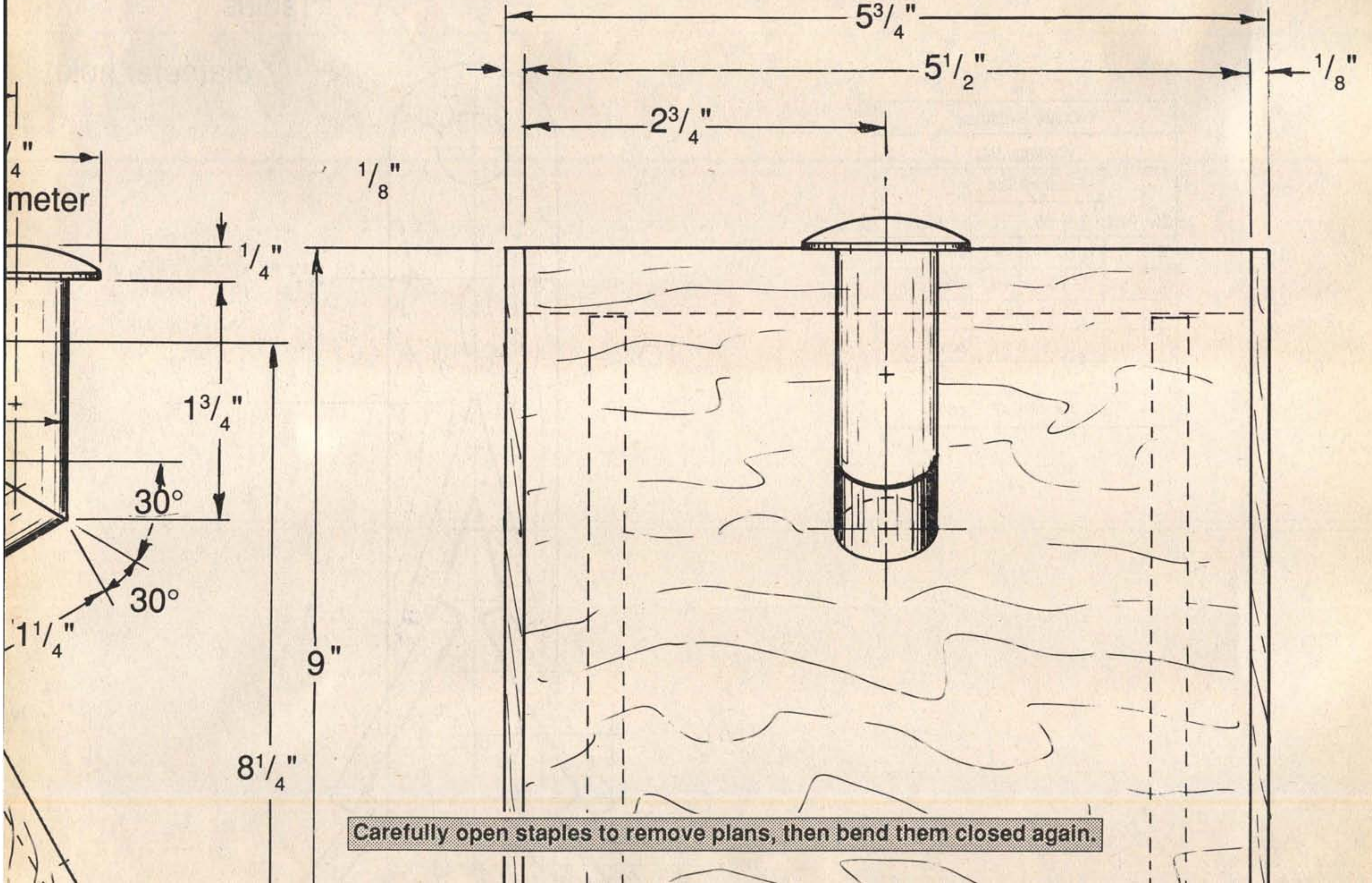

B
A



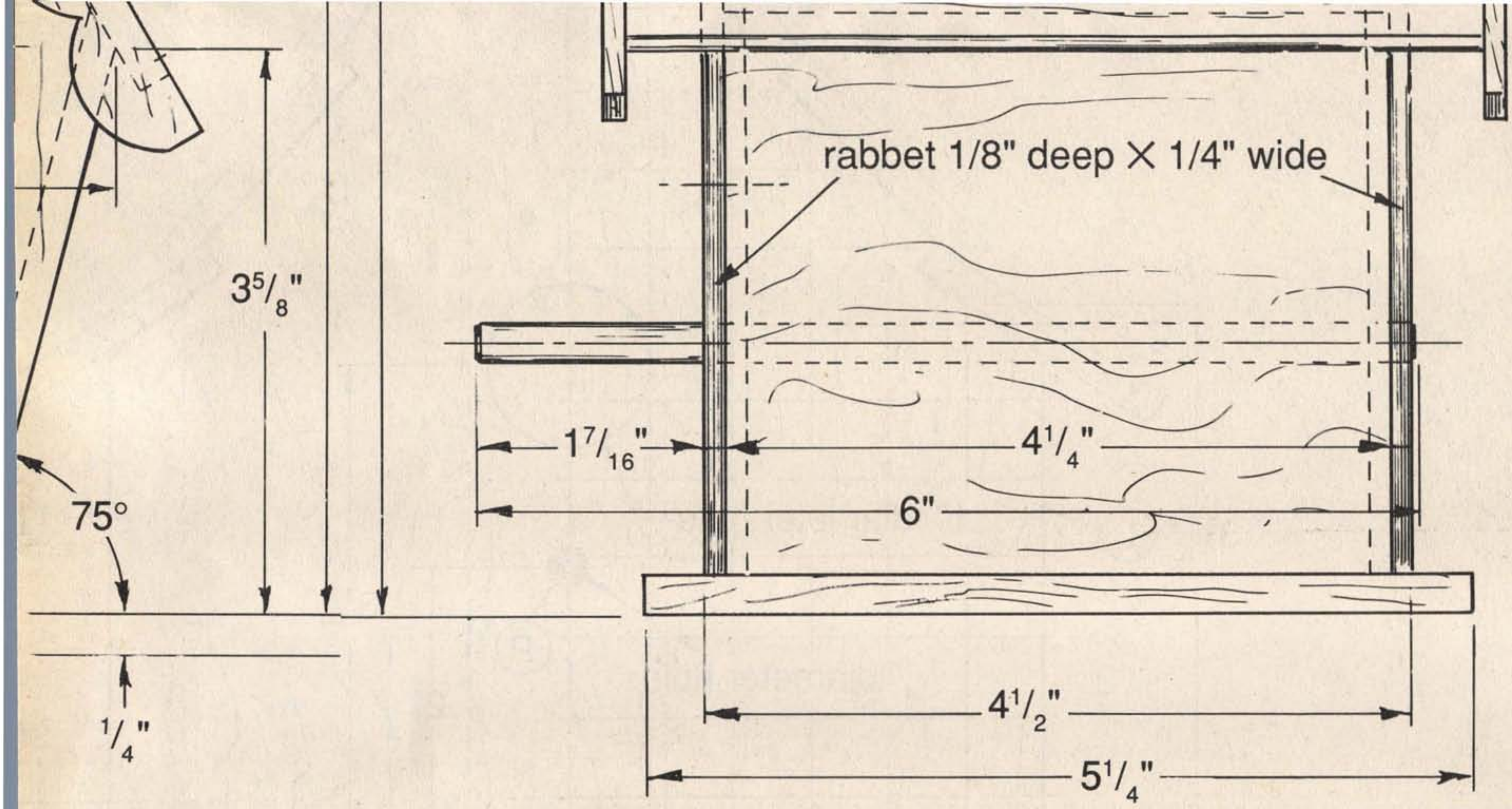
Victorian Table					
Cutting List					
		Finished Size			
Qty	Part	T	W	L	Piece
4	A	$^3/_4$"	$3^1/_2$"	$14^1/_2$"	legs
1	B	$1^1/_2$"	$1^1/_2$"	24"	stem
1	C	$^3/_4$"	$2^1/_4$"	$9^1/_2$"	top support
2	D	$^5/_{16}$"	$1^5/_8$"	$13^3/_4$"	apron sides
2	E	$^5/_{16}$"	$1^5/_8$"	11"	apron ends
1	F	$^3/_4$"	14"	$16^3/_4$"	top

Folk Art Birdhouse					
Cutting List					
		Finished Size			
Qty	Part	T	W	L	Piece
2	K	1/2"	6"	9"	front/back
2	L	1/2"	3 5/8"	4 1/4"	sides
10	M	1/2"	1 3/4"	6 1/4"	roof slats
1	N	1/2"	5"	4 1/4"	bottom
1	O	1/2"	1 1/4"	12"	hanger
1	P	1/4" diameter		3"	perch



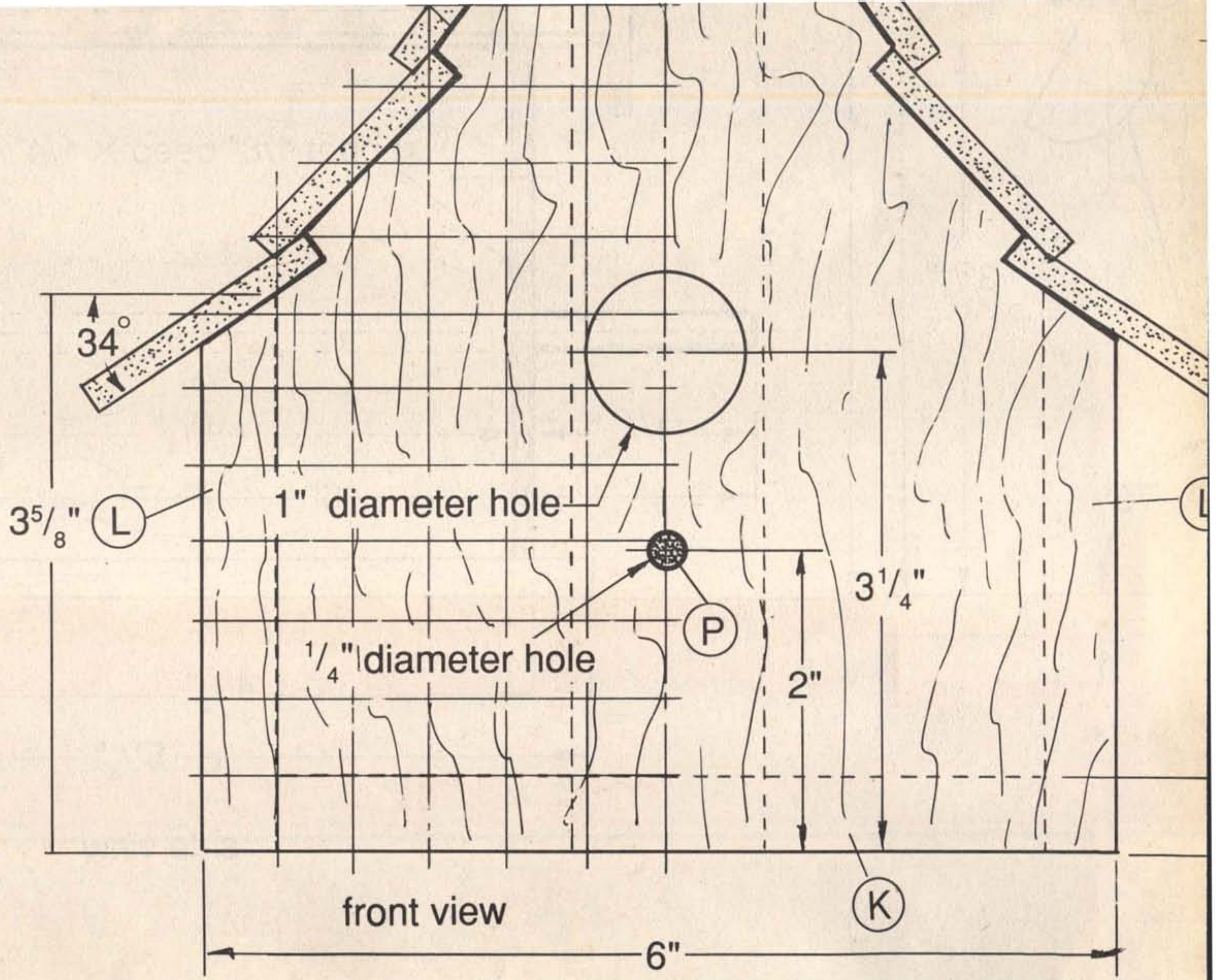


Carefully open staples to remove plans, then bend them closed again.

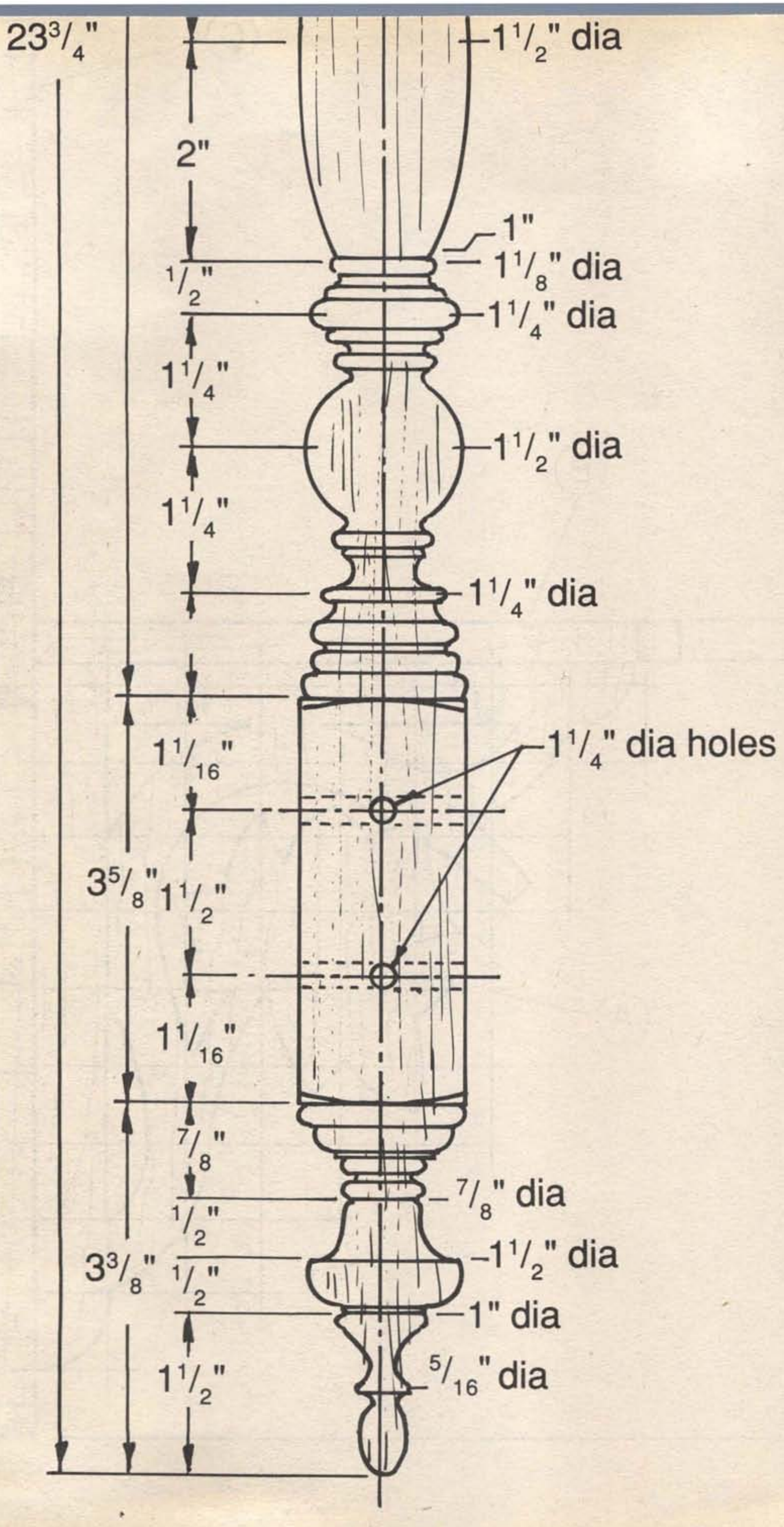


side view

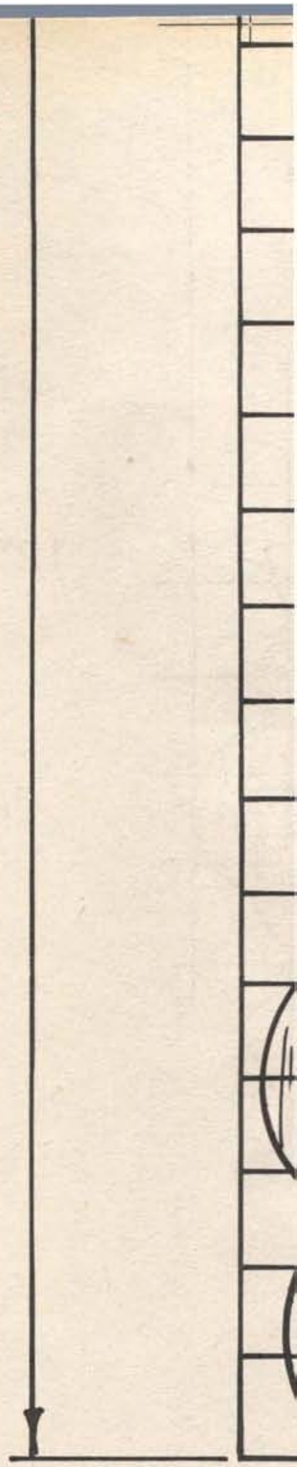
Full–Size

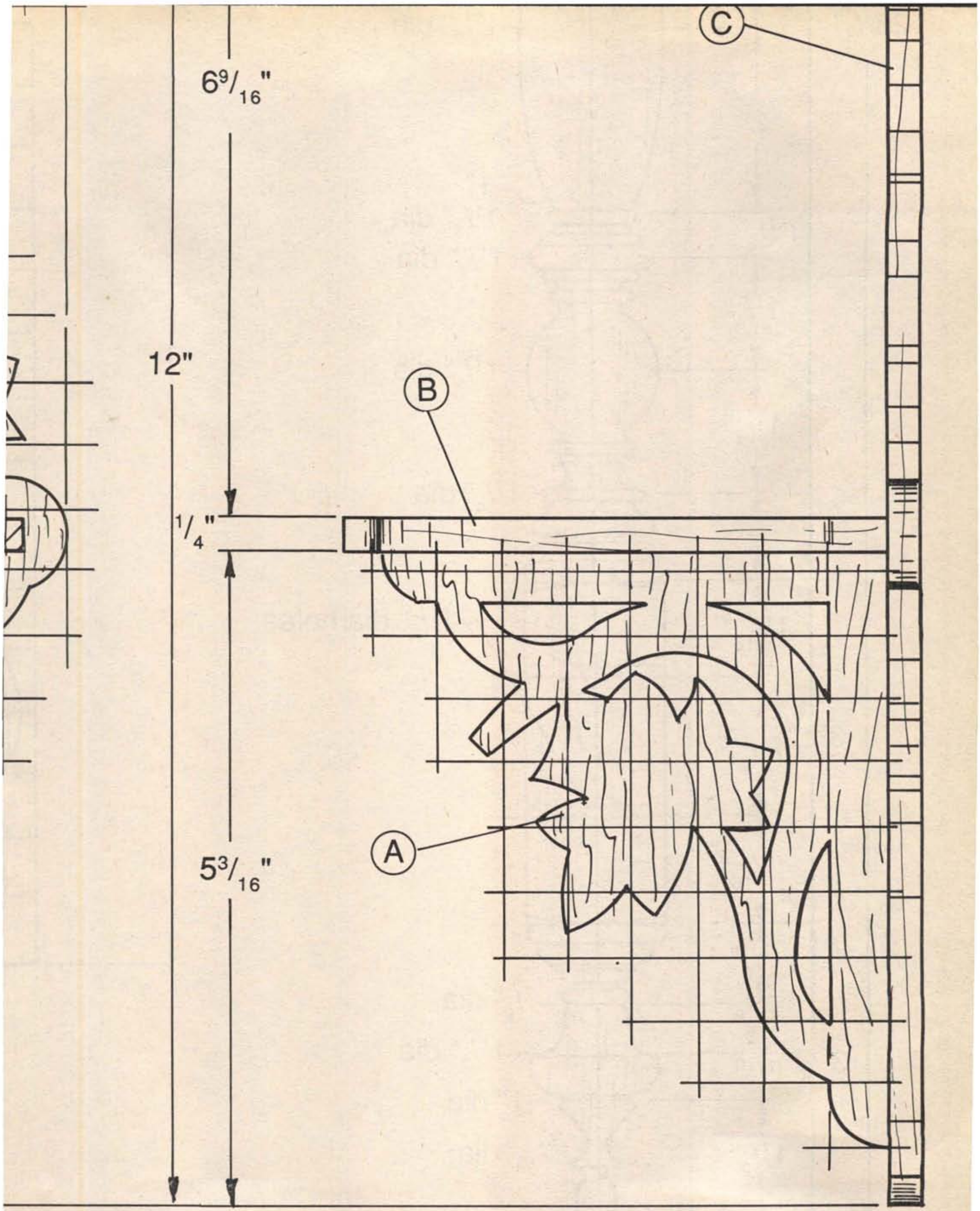

34°
3⁵/₈"
L
1" diameter hole
¹/₄" diameter hole
P
2"
3¹/₄"
K
front view
6"
L

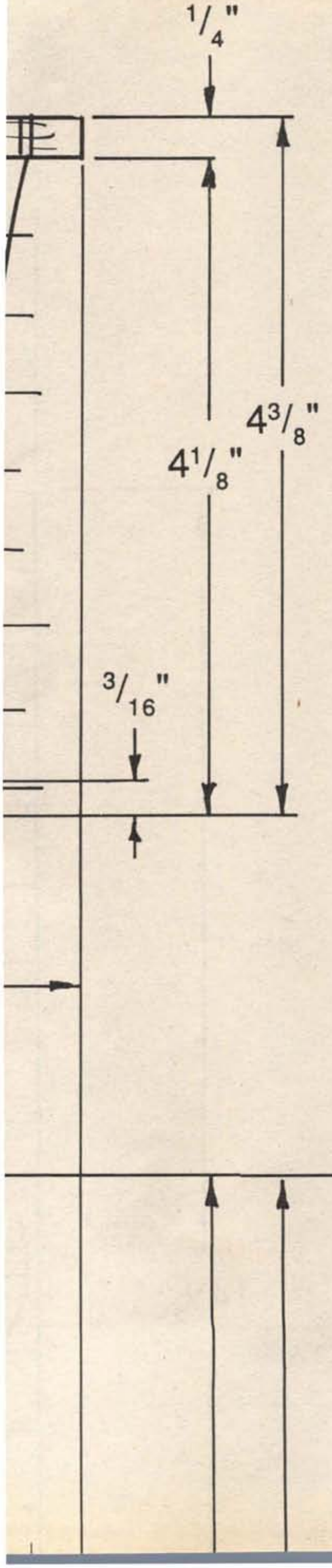
Full-



23 3/4"
1 1/2" dia
2"
1"
1 1/8" dia
1/2"
1 1/4" dia
1 1/4"
1 1/2" dia
1 1/4"
1 1/4" dia
1 1/16"
1 1/4" dia holes
3 5/8"
1 1/2"
1 1/16"
7/8"
7/8" dia
1/2"
1 1/2" dia
3 3/8"
1/2"
1" dia
5/16" dia
1 1/2"




C
6 9/16"
12"
B
1/4"
A
5 3/16"

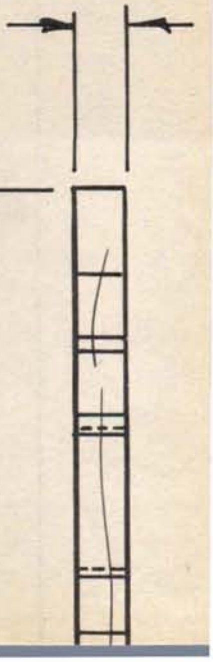


Knick-Knack Shelf

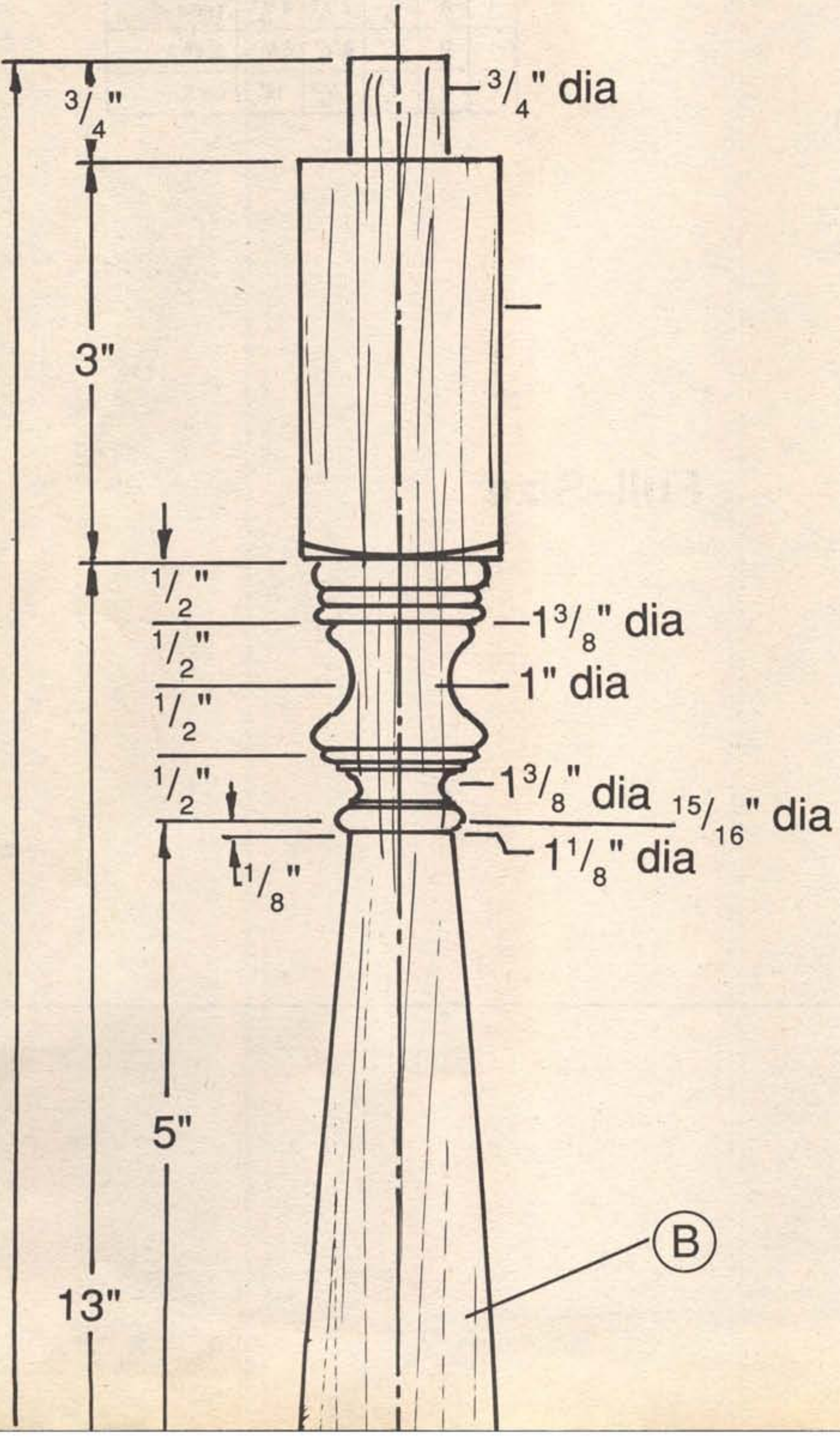
Cutting List

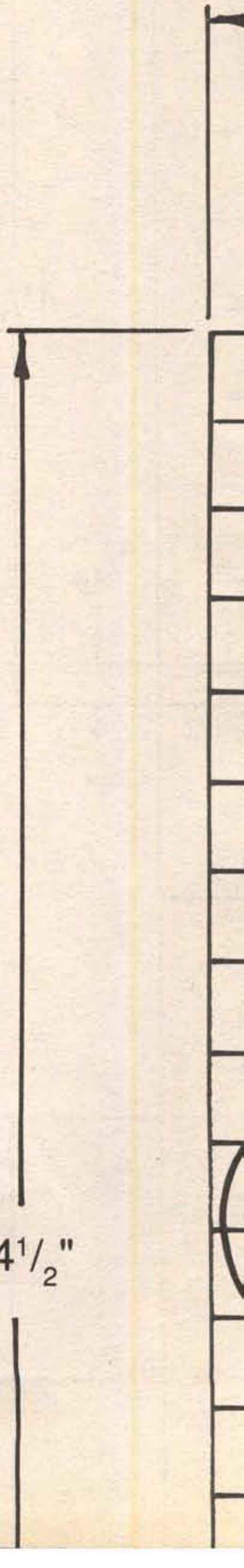
Qty	Part	Finished Size T	Finished Size W	Finished Size L	Piece
1	A	1/4"	3 7/8"	4 5/8"	brace
1	B	1/4"	4 1/8"	6 3/4"	shelf
1	C	1/4"	7 1/2"	12"	back

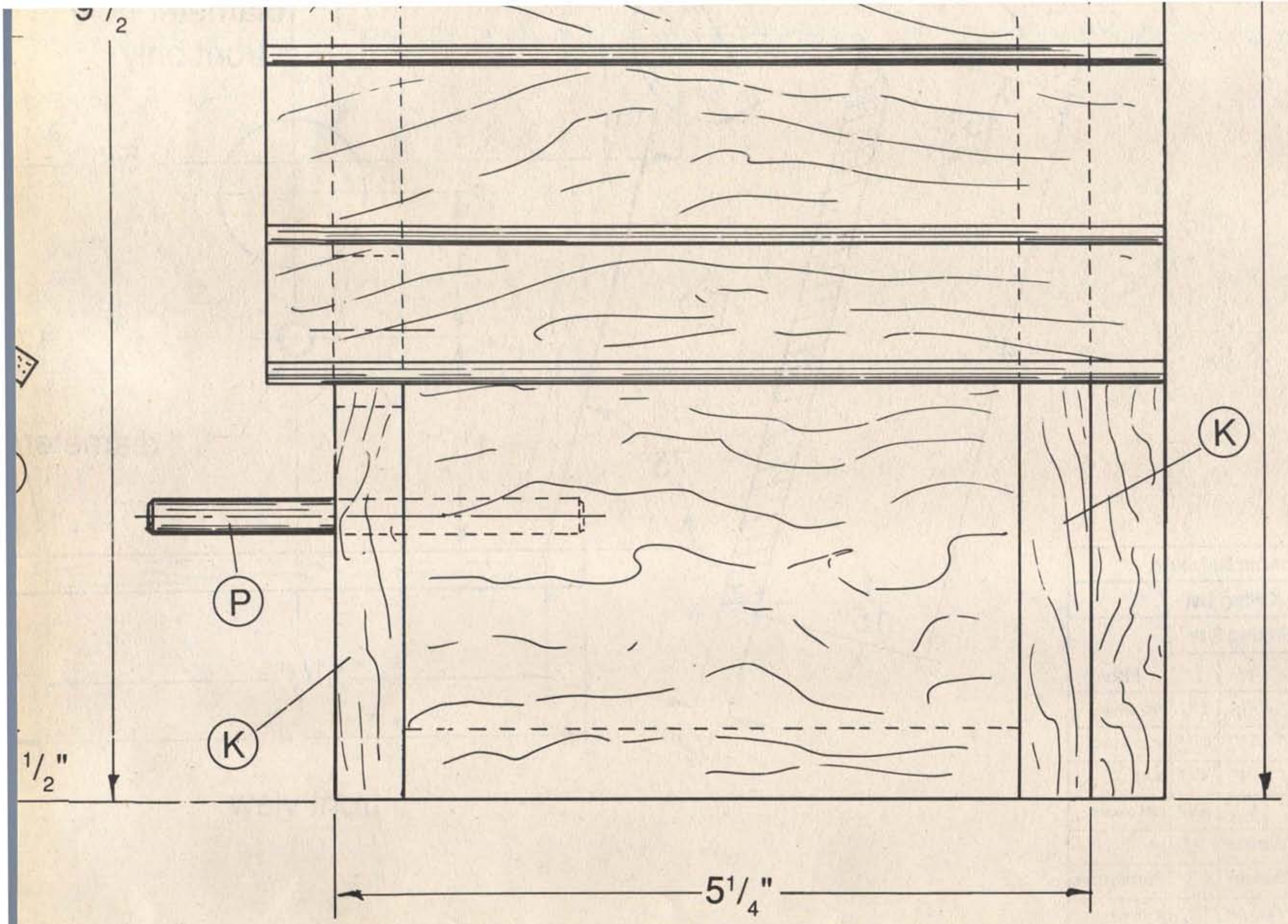
Full–Size



Note: Leg is shown full–size; stem is not.

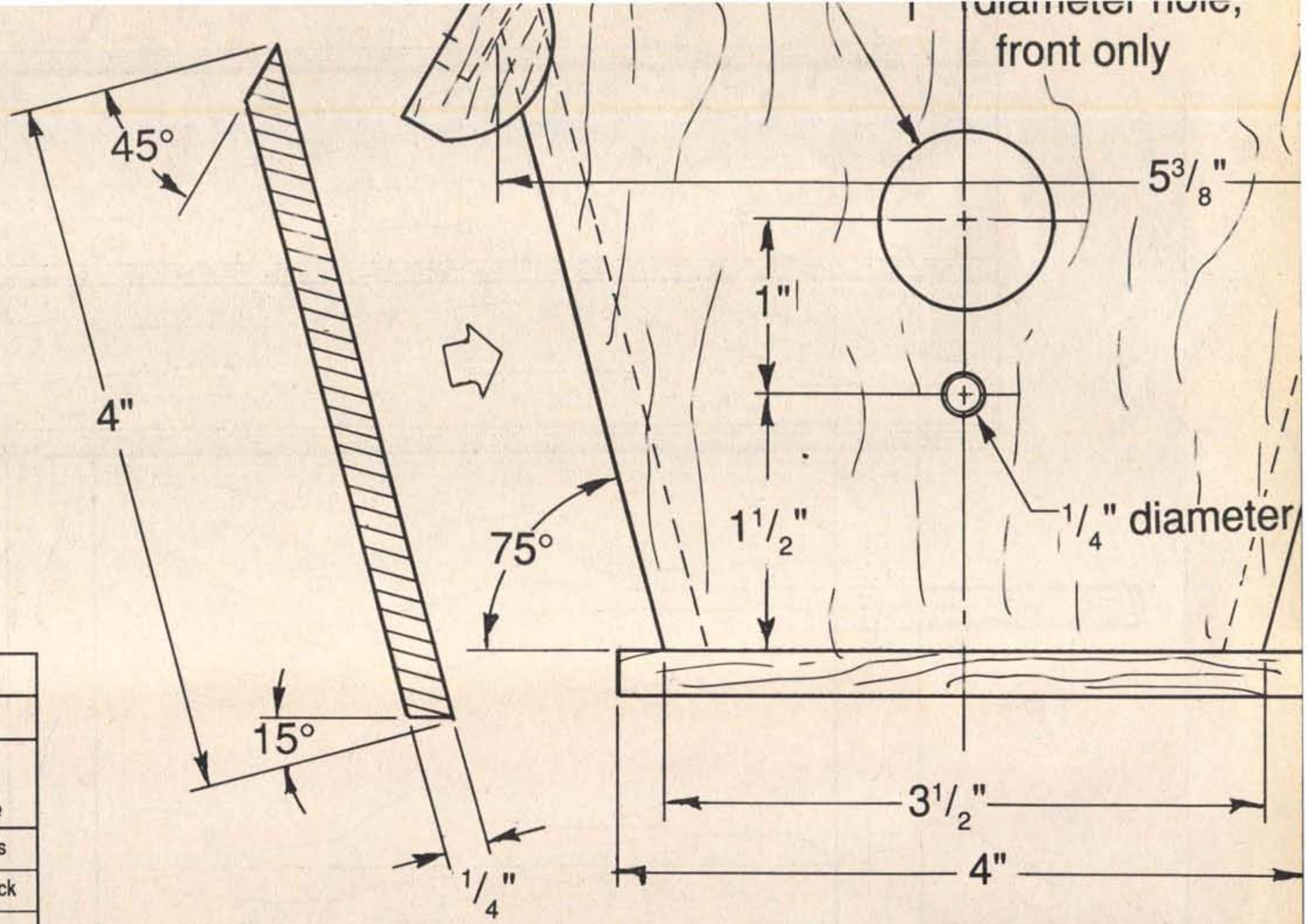






side view

Size

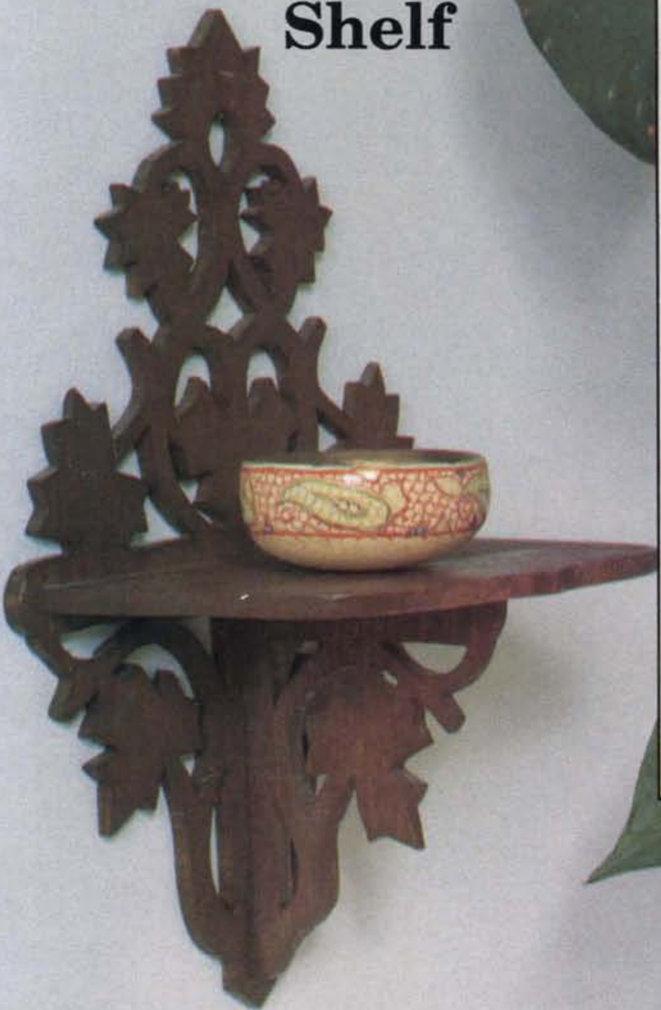


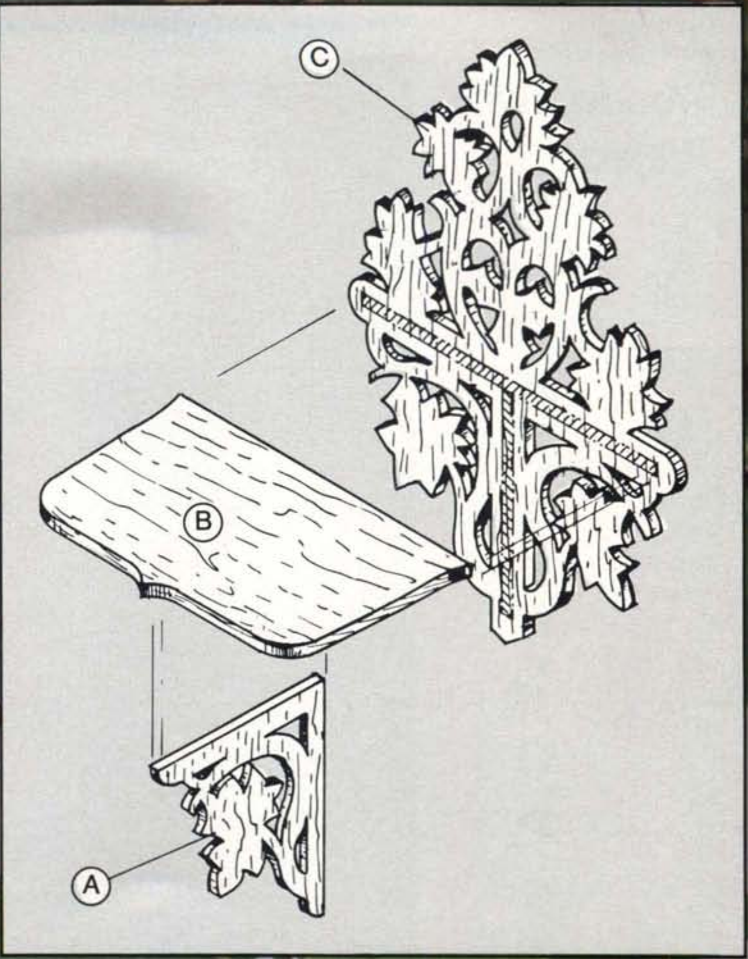
front view

Victorian Birdhouse					
Cutting List					
		Finished Size			
Qty	Part	T	W	L	Piece
4	A	1/8"	5/8"	6 1/2"	trim pieces
2	B	1/4"	5 3/4"	8 1/4"	front & back
2	C	1/4"	4"	4 1/4"	sides
2	D	1/4"	6 1/2"	5 1/2"	roof pieces
1	E	1/8" diameter		5/8"	pin
1	F	3/4" diameter		1 1/4"	chimney base
1	G	3/4" diameter		1 3/4"	chimney
1	H	1/4"	1 1/4" diameter		cap
1	I	1/4" diameter		6"	perch
1	J	4"	4"	5 1/4"	bottom

A Popular Woodworking Project

Knick–Knack Shelf





by John Nelson

Anyone who likes jig saw projects will love this one. You can make this hanging wall shelf out of pine or any hardwood, and use it to hold knick-knacks or plants. These were popular items in the thirties and forties—in those days every woodworker I knew seemed to make one of these for every member of his family.

Make up the 1/4" thick material by planing to size, or purchase it 1/4" thick. If you plane it, you can use either a power planer or plane by hand; hand–planed wood will give this project a more rustic look which you may prefer.

To layout the project, trace the patterns from the PullOut™ Plans in the center of the magazine onto some paper and cut them out (or if you don't need the patterns on the other side, cut out the PullOut™ Plans themselves). Rough–cut the wood to the basic overall shape, and then transfer the pattern to the wood.

Begin cutting out the pattern by drilling 1/4" holes in each of the openings. Use these holes to insert a jigsaw and cut out the openings. Cut out all three pieces (A, B, C) and sand all edges, being careful not to round off any corners. Run a bead of glue along the top edge of the brace (A), then nail the shelf (B) to the brace with 1/4" brads. Then glue and nail the shelf and brace to the back (C).

Sand all flat surfaces again, and stain the piece with a stain of your choice. Finish with two or three coats of satin varnish. When dry, hang your shelf on the wall by the hole at the top.

***John A. Nelson** is a frequent contributer to* Popular Woodworking.

Knick-Knack Shelf

Cutting List

		Finished Size			
Qty	**Part**	**T**	**W**	**L**	**Piece**
1	A	1/4"	3 7/8"	4 5/8"	brace
1	B	1/4"	4 1/8"	6 3/4"	shelf
1	C	1/4"	7 1/2"	12"	back

A Popular Woodworking Project

Two Birdhouses

by John A. Nelson

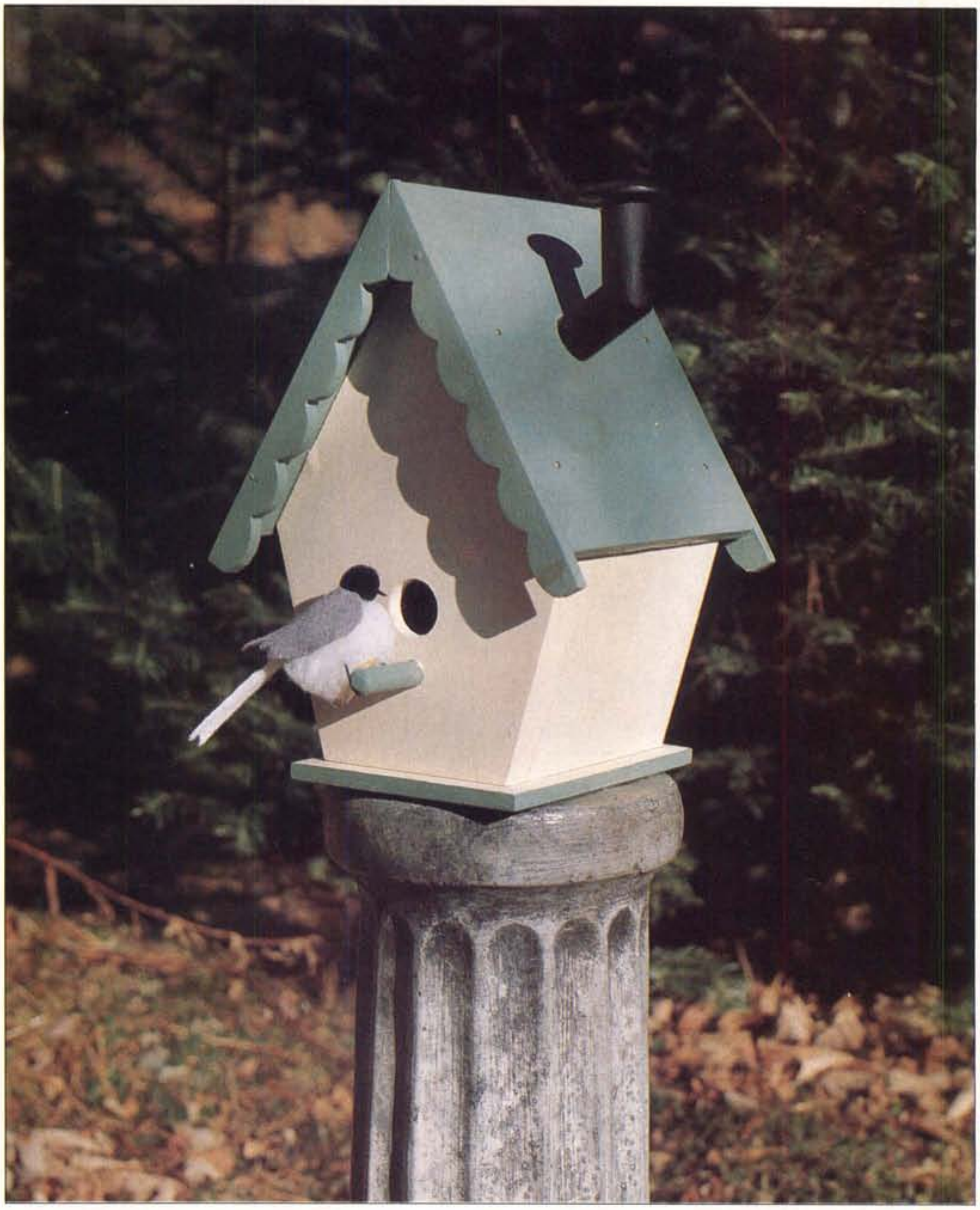


photo by the author

At one time or another every woodworker makes a birdhouse—it seems you just can't get out of it. If you must build one, then, you might as well build one with style. Well, here are two different styles you can build. One is modeled on a Victorian house, and the other on the "folk art" tradition—a "hillbilly birdhouse," if you will. These two examples are good beginner's projects—perfectfor introducing your child or grandchild to woodworking.

Victorian Birdhouse

You can build this out of practically any type of wood, starting with pieces 1/4" thick. You can resaw thicker material to size, plane it down, or purchase 1/4" thick stock. Rip the 1/8" stock for the trim pieces (A) from the edge of 3/4" stock.

After cutting all the pieces to rough size, draw a center line through the middle of the front and back pieces (B). Carefully lay out the dimensions onto the front piece as shown on the PullOut™ Plans in the middle of this issue. Attach this to the back piece, and cut them both out at once so you'll get a perfect match. Next, cut the 1/8" deep, 1/4" wide rabbets on the edges of the front and back as shown in Figure 1 below. Locate and drill the 1/4" diameter holes as shown in both of these pieces, and then separate the pieces and drill the 1" diameter hole in the front piece. (You may want to drill a larger hole depending on the kind of bird you want to attract.) Tape all the trim pieces (A) together and draw the scallop pattern on the top piece, and cut them all simultaneously.

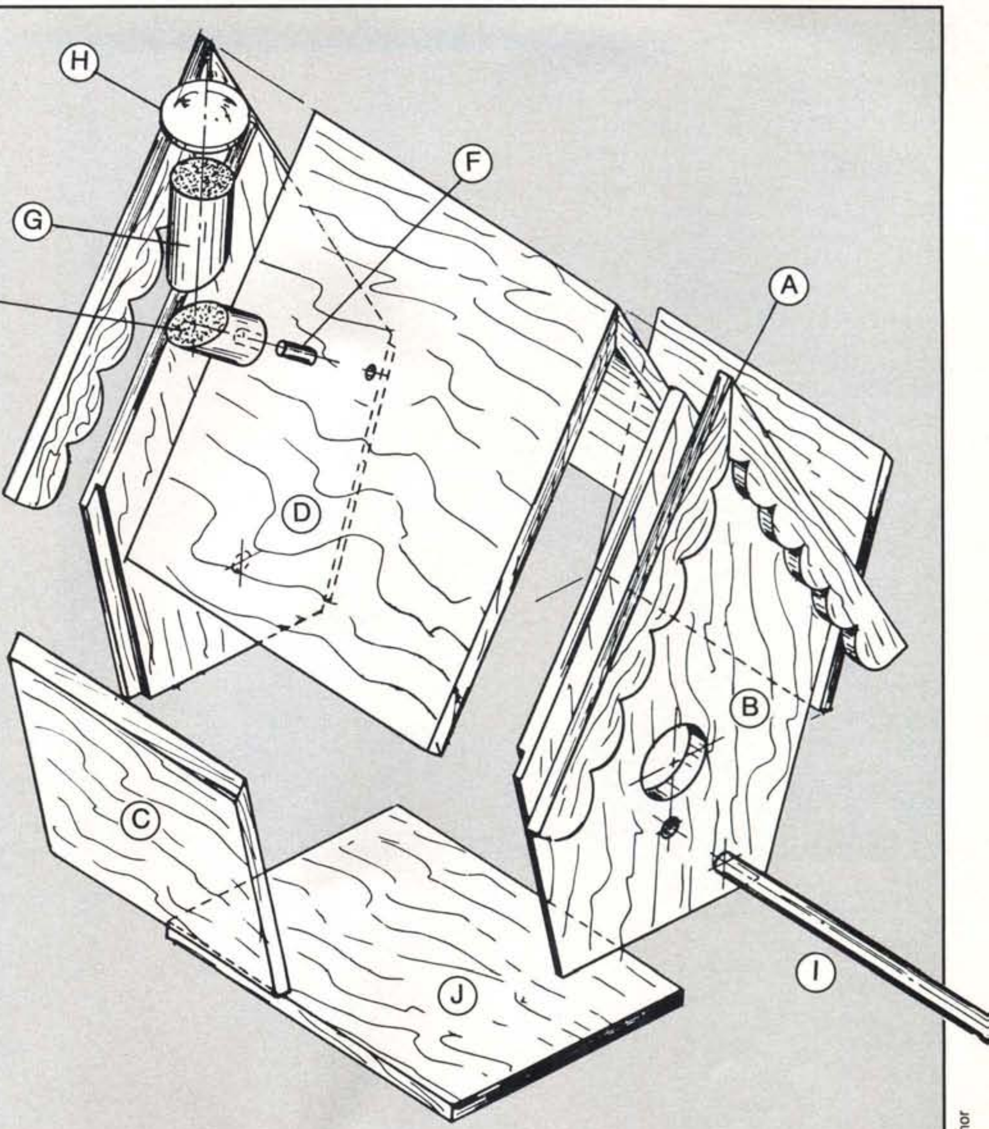
Set the saw blade at 15°, and trim the bottom edge of the sides (C). Reset the blade to 45° to cut the top edge to the final width of the piece.

Tilt the blade again to 30°, and clamp the roof pieces (D) to a scrap of wood and run it through the saw *vertically* to get a 60° angle.

Locate and drill a 1/8" diameter hole in one roof piece for the pin (E) that will hold

John A. Nelson is a woodworker and drafting instructor from Peterborough, New Hampshire, and the author of 21 books on various subjects, including Colonial Classics You Can Build Today (Stackpole Books, Cameron and Keller Streets, P.O. Box 1831, Harrisburg, PA 17109).

Figure 1



Victorian Birdhouse

Cutting List

Qty	Part	Finished Size			Piece
		T	W	L	
4	A	1/8"	5/8"	6 1/2"	trim pieces
2	B	1/4"	5 3/4"	8 1/4"	front & back
2	C	1/4"	4"	4 1/4"	sides
2	D	1/4"	6 1/2"	5 1/2"	roof pieces
1	E	1/8"diameter		5/8"	pin
1	F	3/4"diameter		1 1/4"	chimney base
1	G	3/4" diameter		1 3/4"	chimney
1	H	1/4"	1 1/4" diameter		cap
1	I	1/4" diameter		6"	perch
1	J	4"	4"	5 1/4"	bottom

illustrations by the author

the chimney in place.

Cut a 3/4" diameter dowel as shown for the chimney parts (F and G). Drill a 1/4" diameter hole in the chimney base for the pin. Make the chimney cap (H) from 1-1/4" diameter scrap, or cut any scrap of the 1/4" thick wood into a 1-1/4" diameter disk by sawing and sanding to shape.

Assembly

Dry fit all parts first to ensure that everything fits correctly. Tack the front and back to the sides using short brads. (You could glue these instead, or both tack *and* glue them.) Sand all surfaces, but keep the corners sharp.

It will be easier if you paint the parts now, before the roof is attached. Use any paint you like; let your imagination run wild here—look at pictures of Victorian houses for ideas.

When dry, attach the perch (I) to the front. Tack or glue the two roof pieces together at the peak. Attach the roof to the walls. Glue the chimney parts, (E, F, G and H) together as shown, and glue these to the roof. Attach the trim pieces (A) with brads and glue.

Attach the bottom (J) with small screws so you can remove it occasionally for cleaning. Hang your birdhouse using two eyelets screwed into the top and a wire.

Folk Art Birdhouse

Another variation on the birdhouse is this folk art version, about the same size as the Victorian, but with some differences. This house uses 1/2" material, so first plane or saw your wood to thickness, or buy some already 1/2" thick knot–free wood.

Cut all the parts to rough size, using the cutting list, and label each as you go. Using the full–size pattern from the PullOut™ Plans section in the middle of this issue, copy the pattern for the front and back pieces (K) onto the front piece. Tack the front and back together, and cut out the pattern on both at once, using a coping saw or a band saw. Separate the parts, and drill the 1/4" diameter and 1" diameter holes in the front as shown.

photo by the author

Cut the sides (L) so that they match, and cut the top edge of each at a 34° angle. After cutting the ten roof slats (M), cut the 75° angle in the top of two of the pieces where they will join at the peak. To do this, set your table saw blade to 37-1/2", tape the pieces to some scrap wood so you'll have something to hang onto, and pass them through the saw vertically.

Assembly

Dry fit all parts first to ensure a tight fit. Glue and nail the front and back to the sides. Screw the bottom (N) in place so you can remove it later for cleaning. Once again, it is better to paint this project before you put the roof on.

Glue the two top roof pieces together, then glue and tack the rest of the roof pieces on, starting at the bottom. After the glue has dried, cut the back surface of the roof pieces as shown to accommodate the hanger (O). Glue on the perch (P) so it extends about 1-1/4" from the front.

When you're finished, hang your houses up, then hang out your vacancy sign and wait for your new tenants to move in. PW

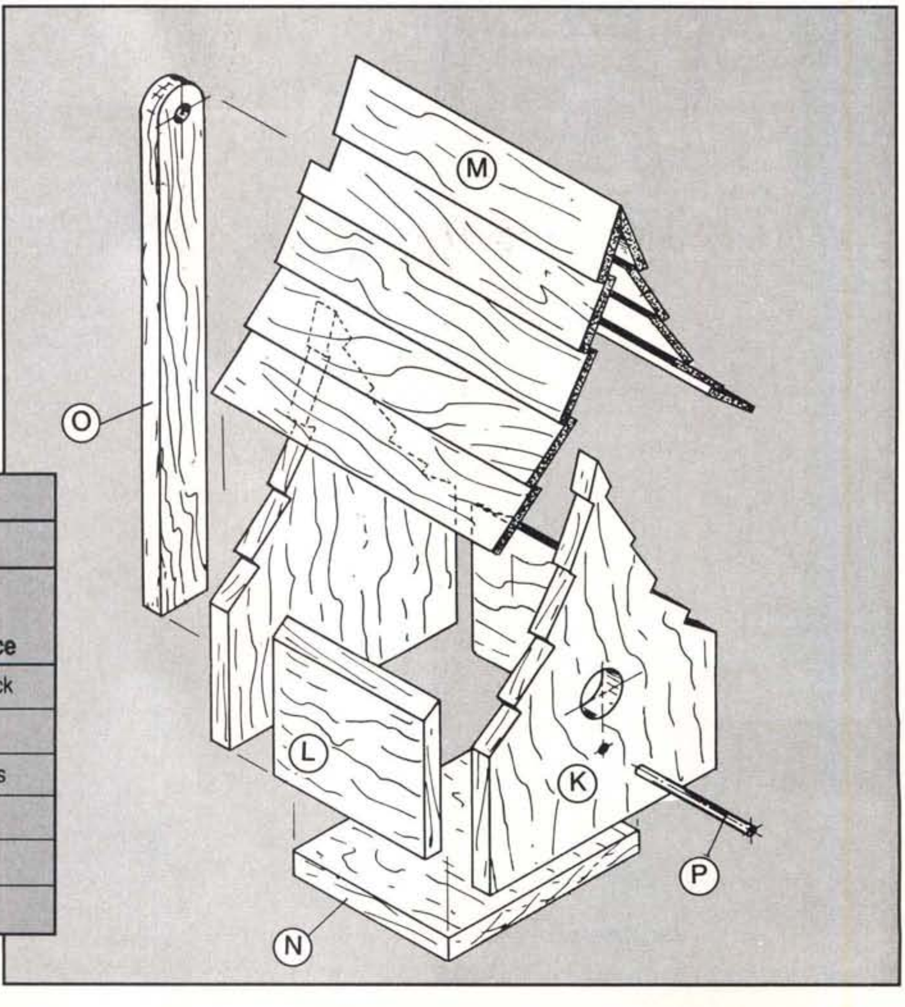
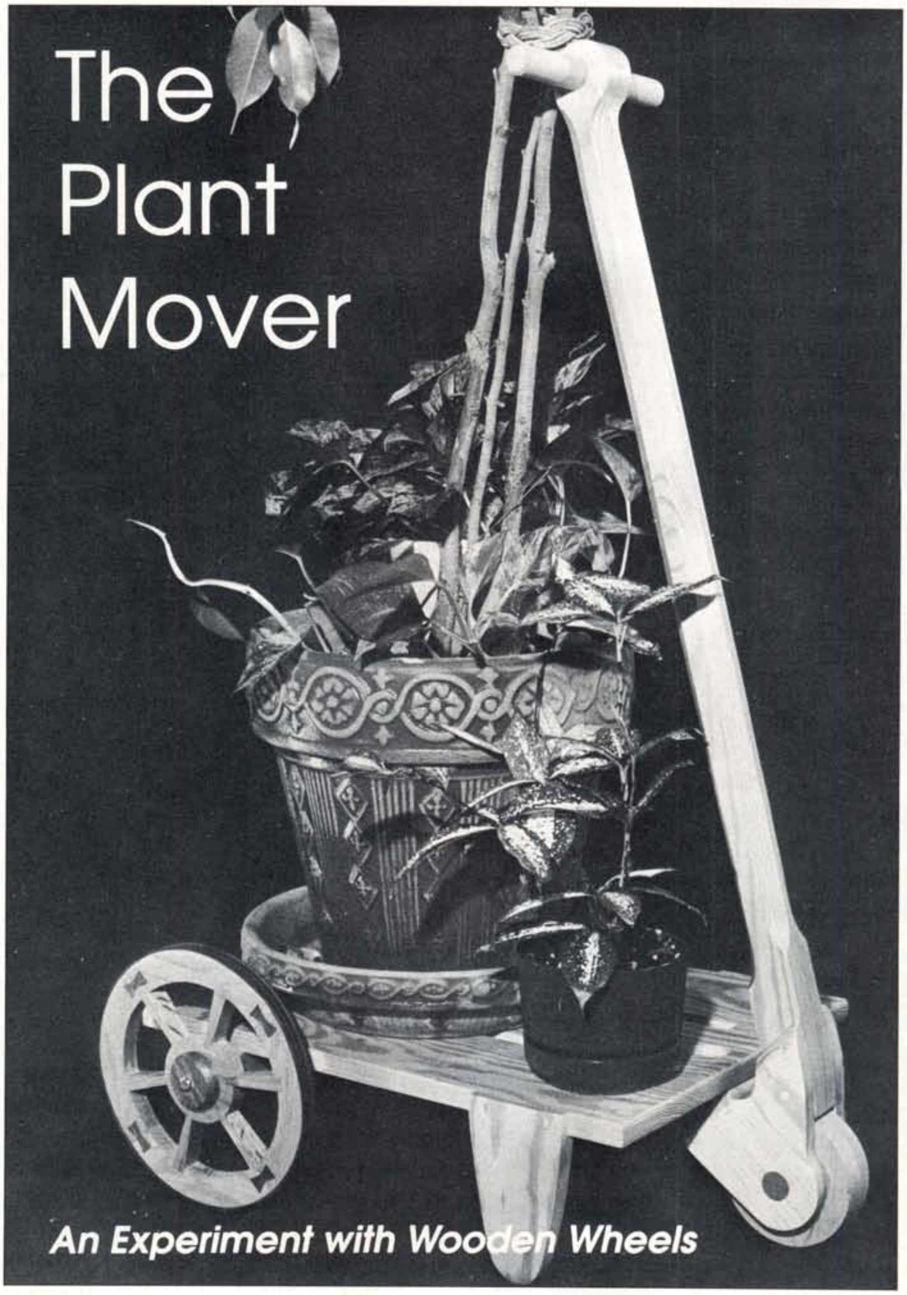


illustration by the author

Folk Art Birdhouse

Cutting List

		Finished Size			
Qty	**Part**	**T**	**W**	**L**	**Piece**
2	K	1/2"	6"	9"	front/back
2	L	1/2"	3 5/8"	4 1/4"	sides
10	M	1/2"	1 3/4"	6 1/4"	roof slats
1	N	1/2"	5"	4 1/4"	bottom
1	O	1/2"	1 1/4"	12"	hanger
1	P	1/4" diameter		3"	perch



The Plant Mover

An Experiment with Wooden Wheels

by Tom Crabb

The problem with wooden wheels and axles is that they can't be fitted tight enough to eliminate wobbling without being so tight they won't turn. What's more, they squeak. The answer, of course, is bearings. But, for silly "purists" like me, using metal parts is high on the list of things to avoid, right under bleeding. The answer may be wooden needle bearings.

I designed this plant mover for two reasons, not the least of which was to try out this needle bearing idea. The other reason was to keep from stumbling through the house with large potted plants every time they needed to be moved out for the summer, in for the winter, out for washing, or just to rearrange the room. It worked. The plant mover does move plants, and the wheels really roll.

The project is built in three sections: the handle and front wheel assembly, the cart, and the back wheels. It doesn't matter which is built first, but I shall start with the handle and front wheel assembly.

The Front Assembly

The handle (A) is laminated from two pieces of 1 × 6. Lay out a grid of 1/2" squares and enlarge the patterns in Figure 1, then trace the handle pattern onto your laminated stock (*only the two ends are* shown—connect these with straight lines to complete the handle). My handle is 36" long, but yours can be longer or shorter depending on the height of the user. Cut out the handle on the band saw, and drill a 1" hole to accept the "T" handle (B). Chamfer the edges of the handle to give it a more refined appearance.

Make the fenders (C) next using the

Tom Crabb *learned woodworking as a boatbuilder. He is the author of* Making Wood Boxes with a Band Saw *and* Band Saw Projects *(Sterling Publishing Co.).*

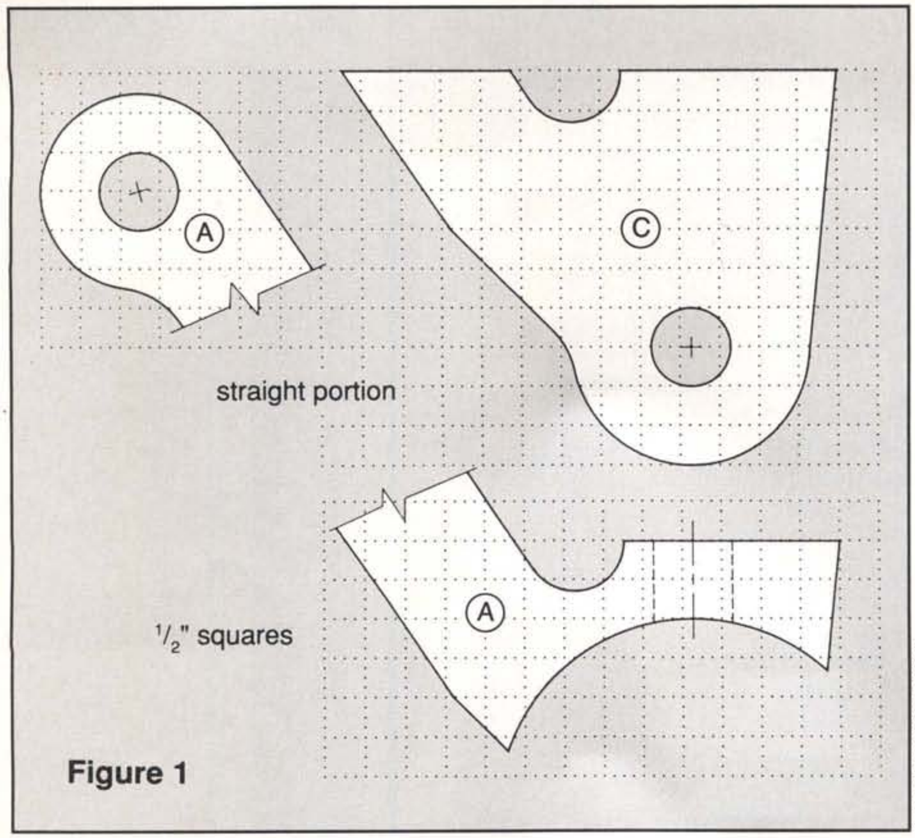


Figure 1

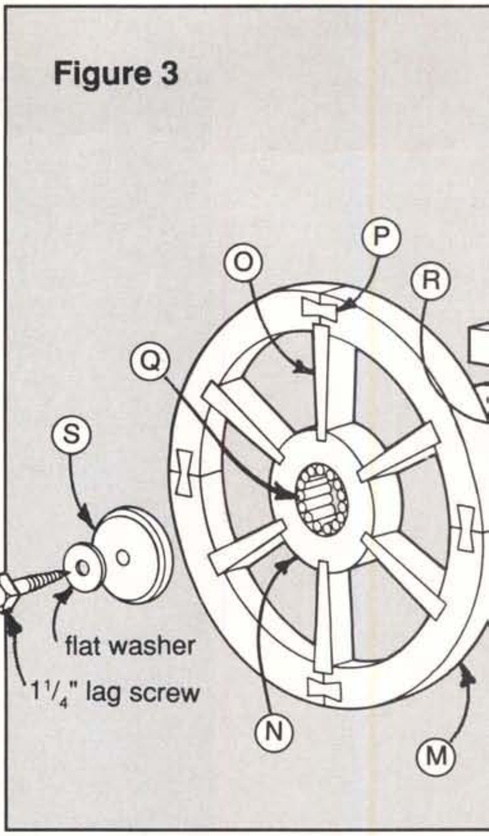
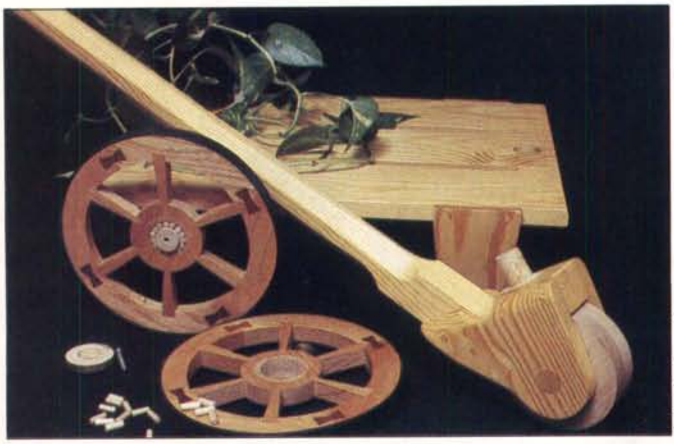


Figure 3

illustrations by Tom Larson



photos by the author

The back wheels and the front wheel use small wooden dowels as needle bearings and larger dowels as axles. The handle and front wheel assembly disconnects from the cart so it can be used for towing other carts.

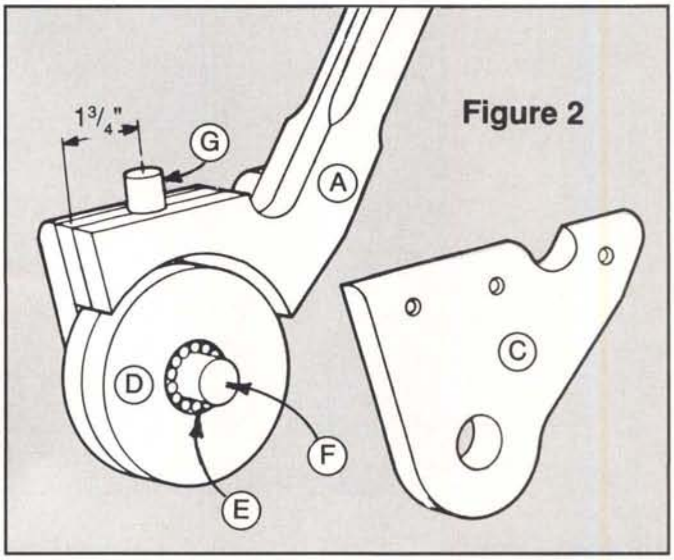


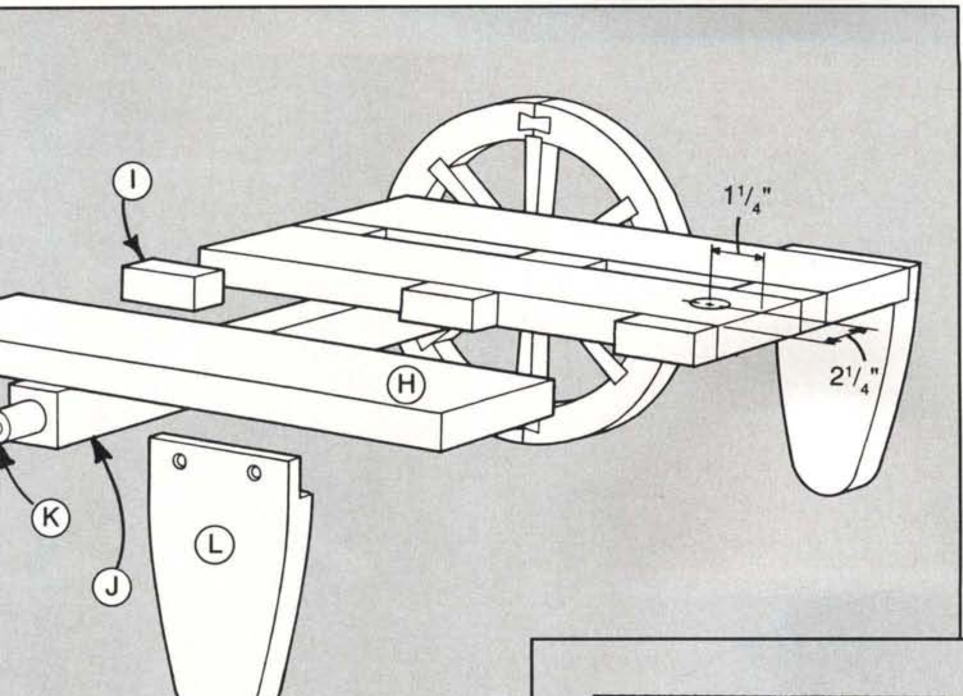
Figure 2

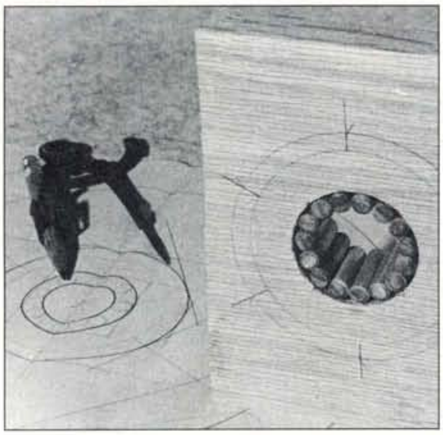
third pattern from Figure 1. Saw them to shape then clamp them together and drill the 1" axle hole where indicated on the pattern. Bevel or round the top edge of each fender to taste, then glue and screw *one to the handle* assembly as shown in Figure 2.

Saw the front wheel (D) from two pieces of oak one–by that have been laminated together. Before drilling the 1-1/2" diameter center hole in your wheel, use an expansion bit to drill a test hole in some scrap, and check the fit of the bearings (E) and the 1" dowel stock you will be using for the front axle (F). The dowel should rotate with ease but without slack; since dowel stock diameters are not always reliable, you may need to make some adjustment on the expansion bit to get the best fit. Lightly sand the inside of the hole with a sanding drum for smoothest rolling.

Sand the front wheel to a thickness of 1-7/16". The needle bearings (E) should also be a shy 1-7/16" and the ends should be slightly beveled so no wood fibers will be left on the ends to interfere with the rolling.

Before you finish putting together the handle and front wheel assembly, bore a 1" hole centered about 1-3/4" from the front edge of the handle for the hitch pin (G) as shown in Figure 2. Glue the hitch pin and the front axle (F) in place. Fit the bearings (E) into the wheel hub, slip the wheel onto the axle and then glue and





Use an expansion bit to drill test holes in scrap wood. Try the bearings and your axle stock for fit, and adjust the drill bit as needed.

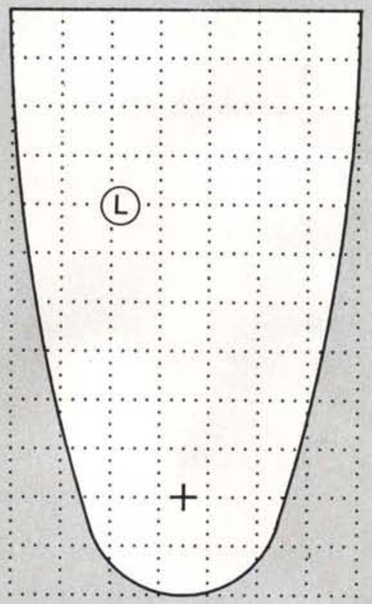


Figure 4 $^1/_2$" squares

The Plant Mover					
Cutting List					
		Finished Size			
Qty	**Part**	**T**	**W**	**L**	**Piece**
1	A	$1^1/_2$"	$5^1/_2$"	36"	handle
1	B	1" dowel		8"	"T" handle
2	C	$^3/_4$"	7"	5"	fenders
1	D	$1^7/_{16}$"	$4^1/_2$" diameter		front wheel
15	E	$^1/_4$" dowel		$1^7/_{16}$"	front bearings
1	F	1" dowel		3"	front axle
1	G	1" dowel		$1^1/_2$"	hitch pin
3	H	$^3/_4$"	$4^1/_2$"	20"	cart slats
6	I	$^3/_4$"	$^3/_4$"	2"	spacer blocks
1	J	$1^1/_2$"	$1^1/_2$"	$15^1/_4$"	rear axle support
2	K	1" dowel		$3^1/_2$"	rear axles
2	L	$^3/_4$"	$3^1/_2$"	6"	legs
8	M	$^3/_4$"	3"	$11^1/_4$"	rim pieces
2	N	$^3/_4$"	3" diameter		hubs
12	O	$^3/_4$"	$^1/_2$"	$1^1/_2$"	spokes
8	P	$^3/_4$"	$^1/_2$"	1"	butterfly ties
30	Q	$^1/_4$" dowel		$^{11}/_{16}$"	rear bearings
2	R	$^1/_4$"	$2^1/_2$" diameter		retainer washers
2	S	$^1/_2$"	$2^1/_2$" diameter		hubcaps
Supplies					
12	#8 × $1^1/_4$" flat head wood screws				
2	$^1/_4$" × $1^1/_4$" lag screws				
6	#6 × $^3/_4$" flat head wood screws				
2	flat washers				

screw the other fender (C) in place. If you roll your handle around the shop and it doesn't roll quite smoothly, don't worry about it; with a little weight and a little wear, it will surprise you.

The Cart

The cart itself is very easy to make. The bed consists of three slats (H) spaced 3/4" apart by 2" spacer blocks (I). Glue it together like an edge–glued tabletop (see Figure 3).

Cut the rear axle support piece (J) to size and bore a 1" diameter hole 2" deep into each end. Glue the rear axles (K) into these holes making certain that they extend 1-1/2" beyond the axle support. Center this assembly about 4" in from the back of the cart and attach it with screws driven down through the bed.

Enlarge the pattern in Figure 4 to make the legs (L). Cut a 3/4" deep, 3/4" wide rabbet along the top edge of each then cut out the shape. Attach them to the cart at about 2" from the front edge with glue and screws.

Bore a 1" hole in the center slat of the bed 1-1/4" from the front edge to receive the hitch pin of the handle. Sand the hole for a sloppy fit so the pin slips in and out smoothly. The handle is not permanently attached, but rather is inserted whenever it's time to move the plants.

The Rear Wheels

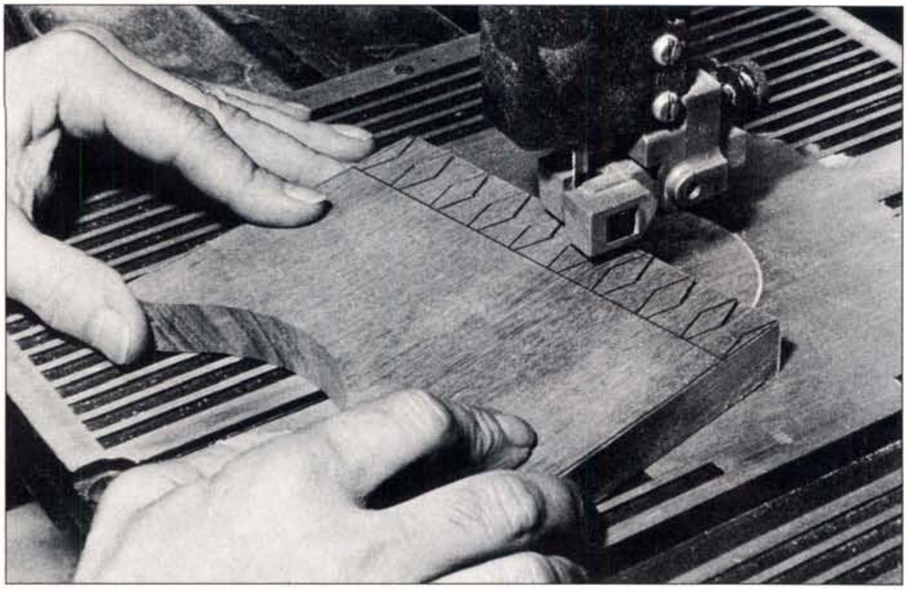
The rear wheels are made of oak, except for the butterfly ties which look nice if made of a contrasting wood such as the mahogany I used. Cut the rim pieces (M) to size and miter the ends at 45° so their inside edges are 4-7/8" long.

Enlarge the squared pattern of the rim section in Figure 5, and transfer it onto the stock with the pieces laid out like two picture frames. Lay out the hubs (N), spokes (O) and butterfly ties (P) as indicated in Figure 5, and cut out all these pieces on the band saw.

Number each butterfly tie and trace each one individually onto the rim stock, noting the position of each. (It helps to hold the rim pieces together with a band clamp while you do this). Cut out the mortises for the ties carefully, making sure the blade stays on the waste side of the line. Loosely assemble the rims and ties so you can sand the outside and inside of the rims.

Fit the spokes to the hub first. It is best to lay out the hub with all the spoke positions drawn in, then bore the axle hole, saw the hub to shape and saw the spoke slots. With the hub and spokes together, lay out the spoke positions on the rim, which is still temporarily held together with the ties. Carefully center the hub by measuring the distance between it and the rim on all sides. Mark around each spoke, remove the ties from the wheel and saw out the notches for the spokes. When everything fits properly, glue the wheels together.

Make the rear bearings (Q) the same as the front bearings but just shy of 3/4" in



Use your band saw to cut the butterfly ties from a contrasting hardwood. Make sure to cut them with the grain running lengthwise.

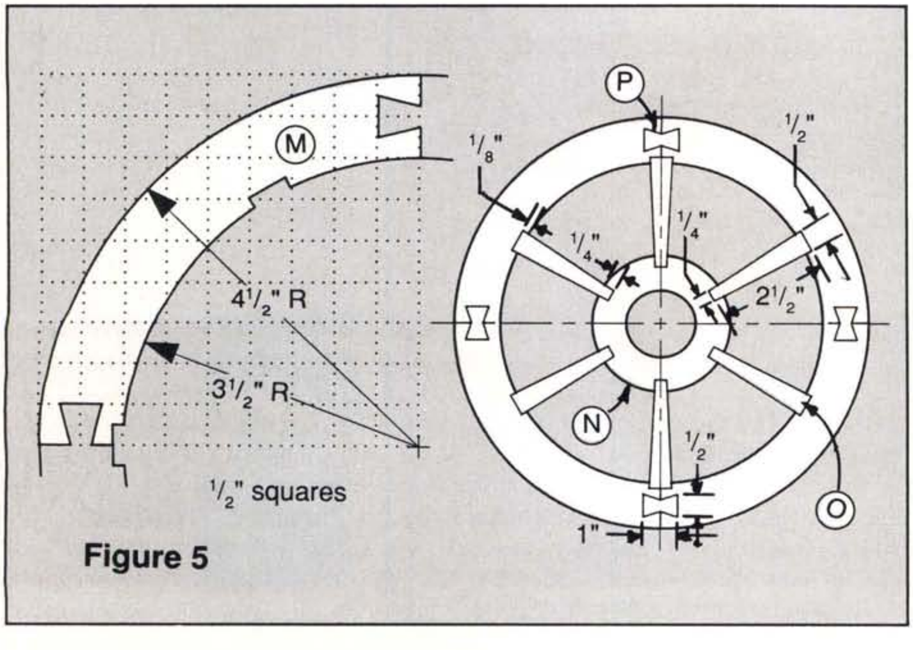
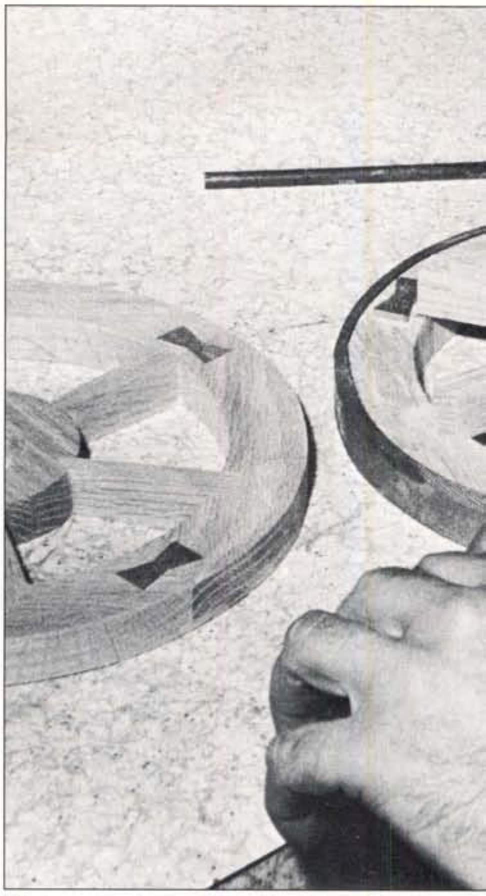
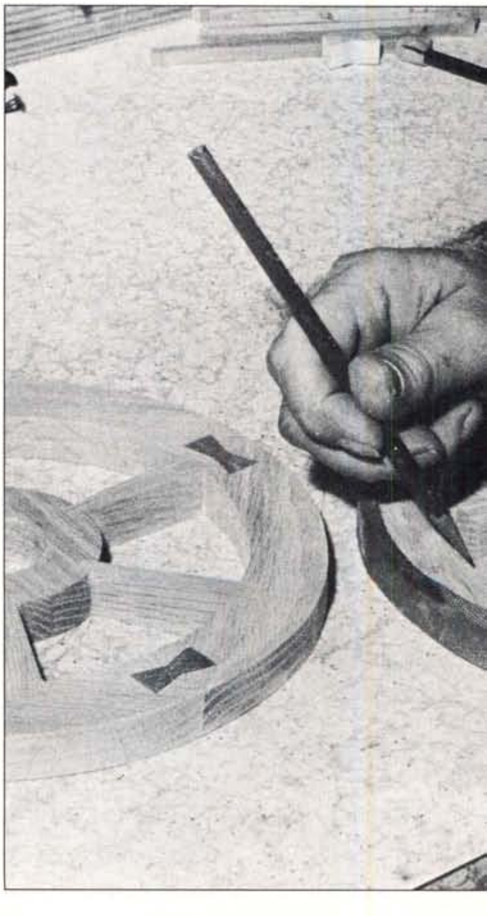
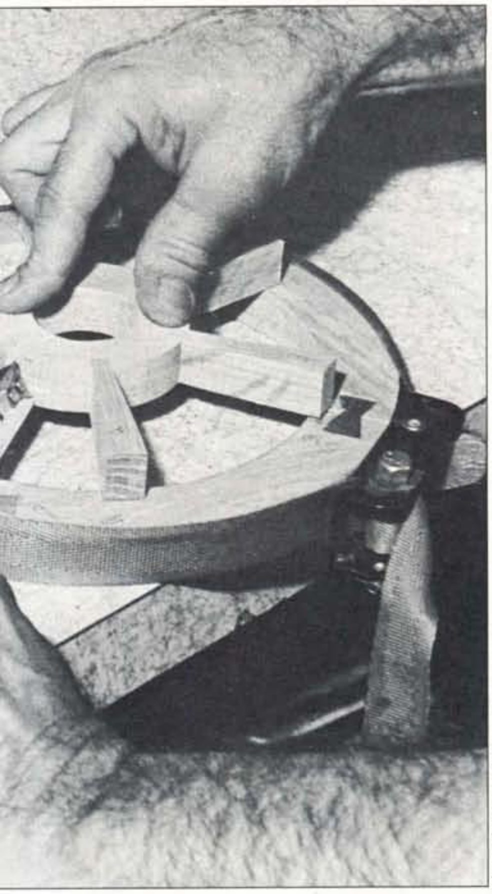


Figure 5



First, center the hub by measuring all around the rim...





photos by the author

...then mark the locations of the spokes.

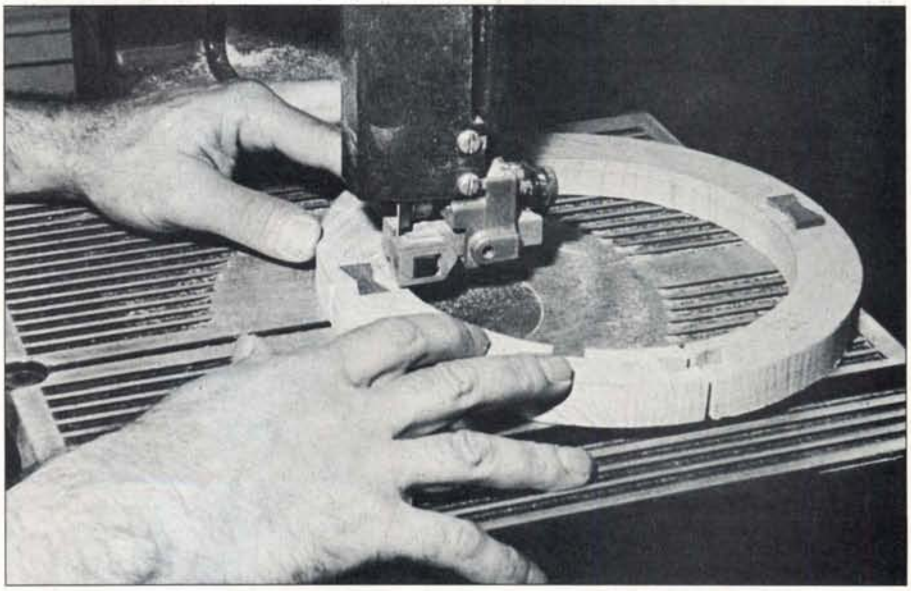
length. Cut the retainer washers (R) to size and bore 1-1/16" holes in the center of each so the wheel will ride on the bearings and not the washers. To locate the washer put the needle bearings in the wheel with a short piece of 1" dowel substituting for the axle. Slip the washer over the dowel and position it making sure it does not touch the outside of the dowel, then screw it in place with three evenly spaced screws.

Cut the hubcaps (S) to size and bore a 1" diameter hole 1/4" deep to fit over the ends of the axles. With the wheels and bearings in place, secure the hubcaps with a 1-1/4" lag screw in each. Bevel the outside edge of the hubcap for appearance.

One option you might wish to consider for the cart is putting tires on the wheels. An old bicycle inner tube works well. Cut the tube into a band and wrap it around the wheel, stretching it slightly. Cut the tube to length with about an inch overlap, then half–lap the ends and glue them with contact cement. Stretch the tube back onto the wheel and tack it in place with several brads.

Before you varnish the plant mover, it's fun to climb aboard and have someone pull you around the shop a few times.

If you have more than one heavy plant around the house, you only need to build additional carts without additional handles. The handle will work on any cart that is the same height. **PW**



Use the butterfly ties to hold the rim together while you cut out the slots for the spokes.

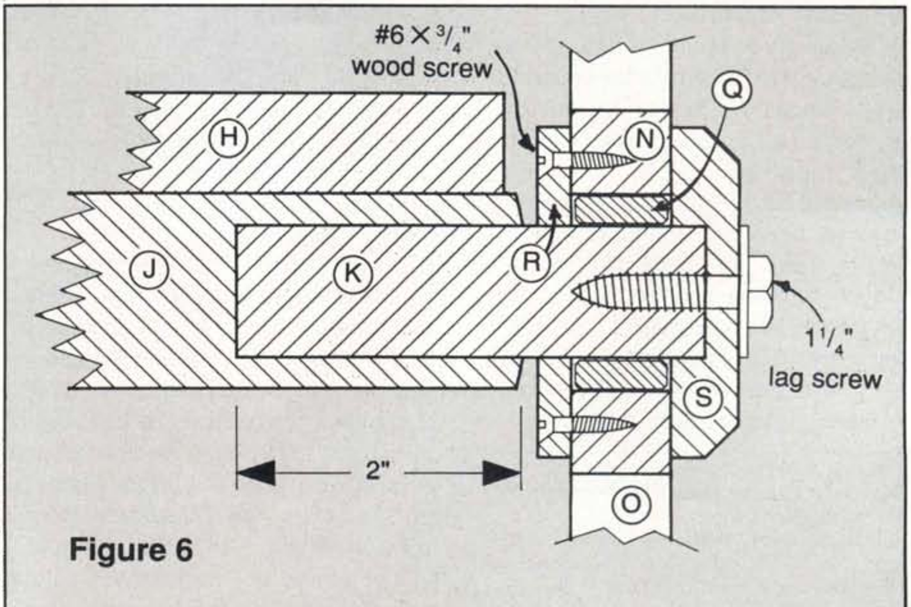
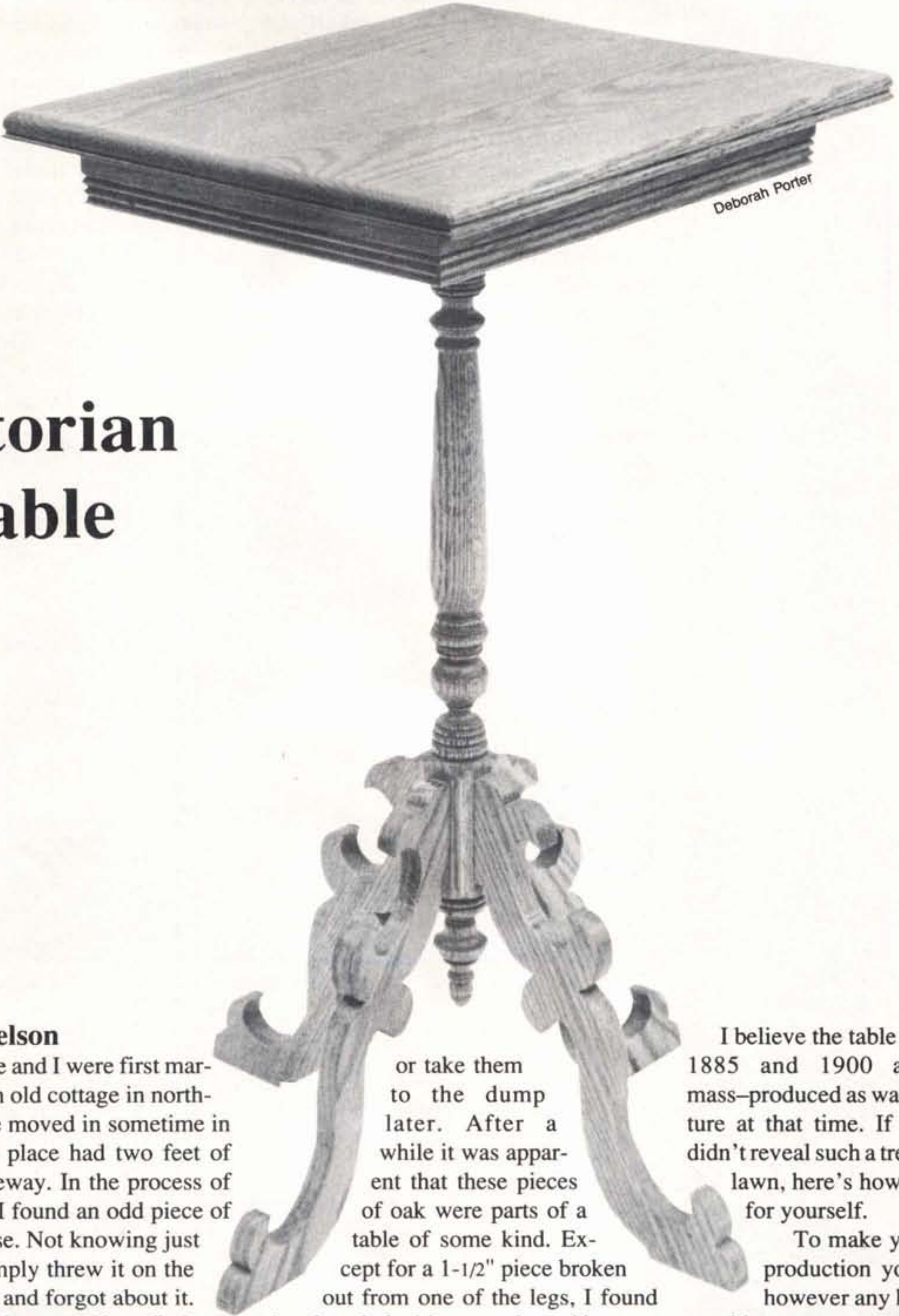


Figure 6

illustrations by Tom Larson

A Popular Woodworking Project


Deborah Porter

Victorian Table

by John A. Nelson

When my wife and I were first married, we rented an old cottage in northern Vermont. We moved in sometime in January, and the place had two feet of snow in the driveway. In the process of shoveling it out, I found an odd piece of oak near the house. Not knowing just what it was, I simply threw it on the side of the house and forgot about it. As spring melted the snow, I kept finding more pieces of oak all over the lawn. I kept throwing them over along the side of the house intending to either burn them or take them to the dump later. After a while it was apparent that these pieces of oak were parts of a table of some kind. Except for a 1-1/2" piece broken out from one of the legs, I found that the whole thing was there. Since we didn't have much furniture, I glued the parts back together. I must have done a pretty good job because the table is still with us after 32 years. It has traveled with us from Vermont to California, Rhode Island and now, New Hampshire. I don't think we would ever part with it; and it will be passed down to the kids, along with its unusual history, in years to come.

I believe the table was made between 1885 and 1900 and that it was mass-produced as was much of the furniture at that time. If this spring's thaw didn't reveal such a treasure on your front lawn, here's how you can make one for yourself.

To make your table a true reproduction you should use oak, however any hardwood will do. I would not recommend using softwood on this project as the legs are too delicate and would not stand up to everyday use.

Cut all material to overall size according to the cutting list. Note the direction of the grain for the legs (A). For strength, the grain direction must run as illustrated. Make the pattern for the legs by copying the full-size pattern from the PullOut™ Plans section in the center of the maga-

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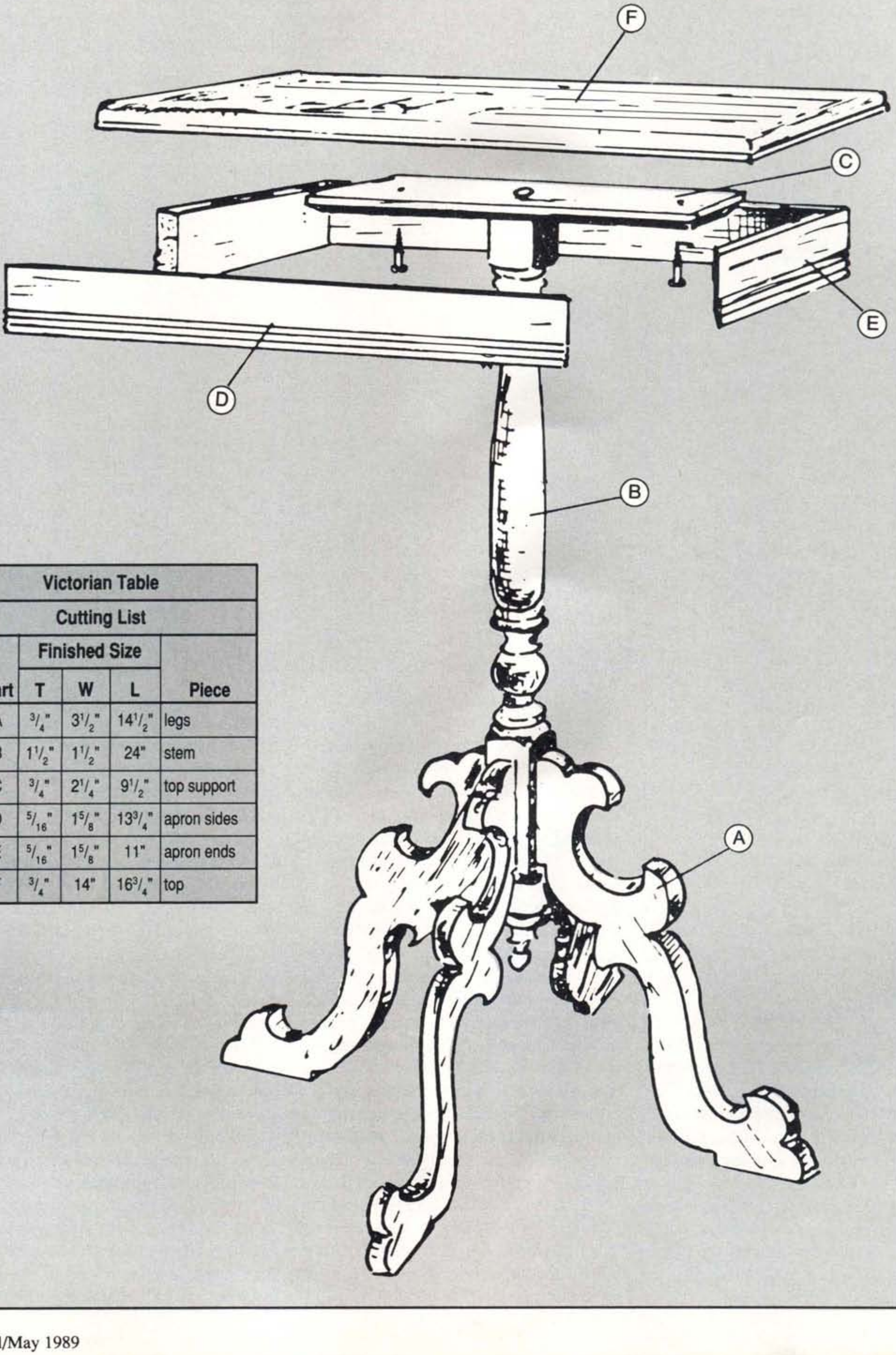
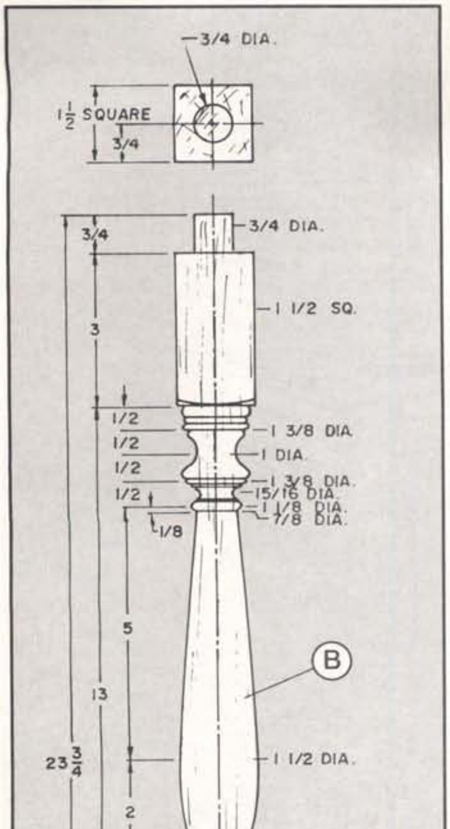
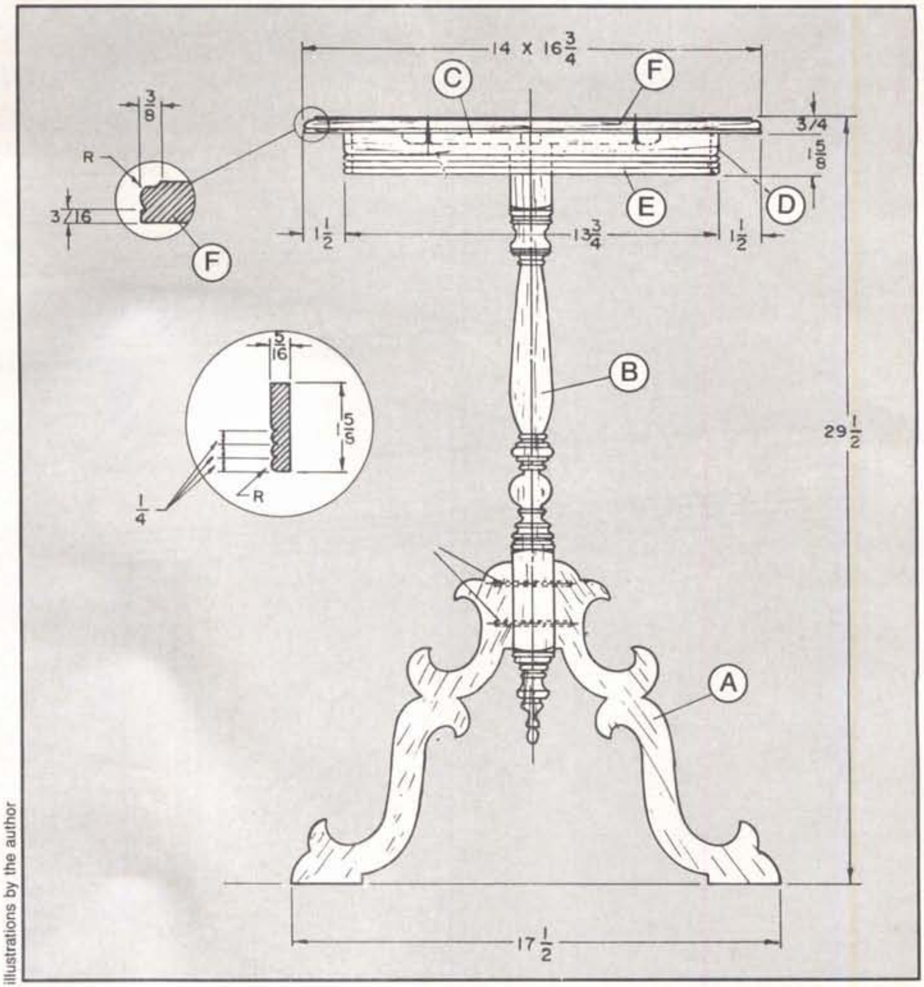
John A. Nelson *is a woodworker and drafting instructor from Peterborough, New Hampshire, and the author of 21 books on various subjects, including* Colonial Classics You Can Build Today *(Stackpole Books, Cameron and Keller Streets, P.O. Box 1831, Harrisburg, PA 17109).*



Victorian Table					
Cutting List					
		Finished Size			
Qty	Part	T	W	L	Piece
4	A	3/4"	3 1/2"	14 1/2"	legs
1	B	1 1/2"	1 1/2"	24"	stem
1	C	3/4"	2 1/4"	9 1/2"	top support
2	D	5/16"	1 5/8"	13 3/4"	apron sides
2	E	5/16"	1 5/8"	11"	apron ends
1	F	3/4"	14"	16 3/4"	top

illustrations by the author





illustrations by the author

zine. It is very important that you maintain exactly 90° between the bottom surface of the leg and the surface that joins the stem (B). Use a large framing square to *double–check* this to make sure the table will sit with all four legs flat and level on the floor.

Trace the pattern onto one leg and tape all four pieces together with double–stick carpet tape so you can cut them out simultaneously. (If this is asking too much of your band saw, cut them out in pairs.) Leave the pieces together to sand the edges.

Next, turn the stem (B). If you use oak, be sure your tools are very sharp and don't rush as oak is very difficult to turn without chipping or splitting pieces out. Wrap masking tape around the three locations where it goes from a square shape to a round shape to help stop chipping out at the corners. Take care to create the 3/4" diameter at the top end so you will have a snug fit with the top support (C). Locate and drill the eight 1/4" diameter holes for the dowels that attach the legs. Place dowel centers in the holes to mark mating holes on the legs. Proper positioning of these holes is crucial, and you should identify each leg and its location.

Mill approximately 5' of stock for the apron pieces (D and E). Sears' three–bead cutter (9 GT 2352) for a table saw moulding head is perfect for cutting this detail.

With the saw blade set at 45°, cut the moulding stock to length for the apron sides (D) and ends (E). Glue the four pieces together making a frame with square corners.

Glue up stock to make the top (F), cut it to size and rout the edges with whatever bits you have that come close to duplicating the edge detail shown. Glue the apron frame to the underside of the top with a 1-1/2" overhang all around.

Make the top support (C) and chamfer all four edges. Drill the mounting hole to fit the pin on the end of the stem (B). Attach the support to the underside of the top with a couple of #8 × 1-1/4" flat head wood screws. Glue the legs to the stem and glue the top assembly onto the pin at the top of the stem.

If you used oak or any porous wood, you should use a wood filler to fill in the grain before applying your finish. Wipe on the wood filler across the grain and allow it to dry for a few minutes. Then wipe it off with a coarse rag, again wiping across the grain. Take care not to pull the filler back out of the pores as you wipe it off. Sand all over and finish with any stain you wish. The original table had a light oak stain and had a high–gloss finish. I don't think burying yours in the snow would add to its authenticity.

A Popular Woodworking Project

Decorative File Cabinet

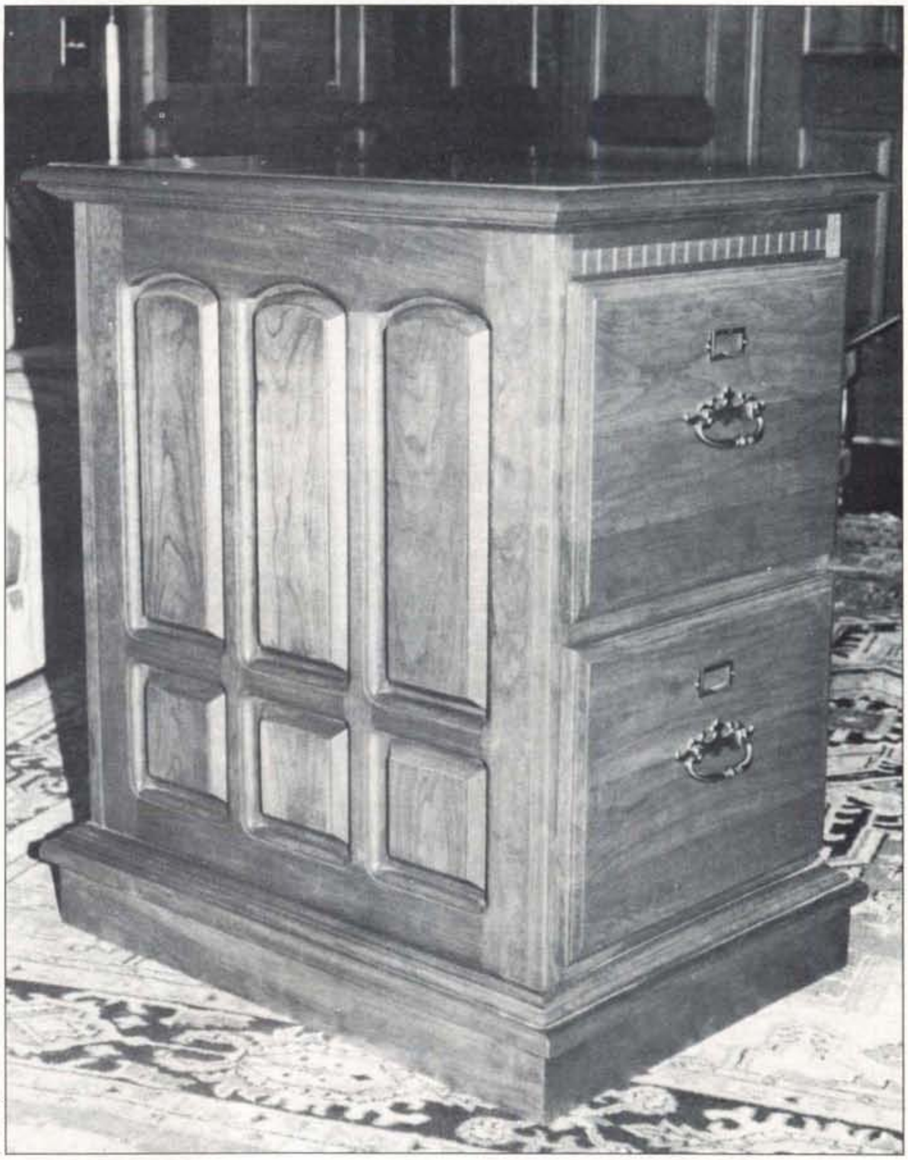


photo by David Lionberger

by Herbert F. Lionberger

I designed this file cabinet as a decorative piece so it could sit next to a desk in the center of a room and look pleasing from all sides. It is made out of solid Adirondack cherry and 3/16" cherry plywood.

Start by cutting the frame pieces (A–J) to the size indicated in the cutting list; the lengths given include 5/8" tenons on pieces that require them. (Note: Dimensions given here that pertain to carcase width provide a 5/8" gap between the sides of the drawers and the carcase. This space is to accommodate drawer guides, most of which require about 1/2+" according to their instructions.) Cut a 1/8" wide, 1/4" deep groove at 1/4" from the top edge of the top rails (A, E and G) for the table irons that will secure the top.

Tenons and Mortises

Set up the dado head on your table saw to cut just a scosh under 1/4" deep, and position a wooden auxiliary fence against the blade as a stop for cutting these 5/8" tenons. Tenon the ends of the side rails (A, B and C), mullions (D), back rails (E and F) and front rails (G and H).

Next, cut 1/4" wide, 5/8" deep mortises in the stiles (I and J), the side rails (A and B) and the mullions (D) as shown in Figure 1. Be careful to locate these mortises on the appropriate edges to establish the proper orientation. (Note that two of the six stiles labeled "I" should only be mortised at the top and bottom since they are for the back frame.) Trim the tenons to

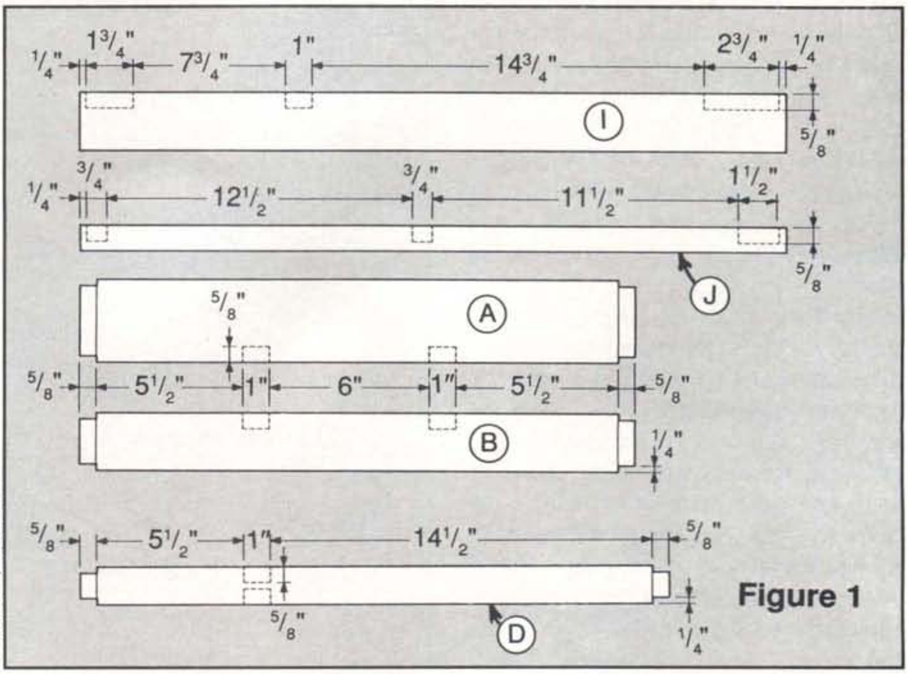


Figure 1

illustrations by Tom Larson

Herbert F. Lionberger is a retired rural sociologist who works wood in his spare time.

fit their mortises and mark all the joints for reassembly.

Fit the mullions into their mortises in the top side rails (A) and mark where their edges touch the rail. Strike an arc with a radius of approximately 4-3/4" between these points (as shown in Figure 2) and cut out the curves, then sand them smooth.

Frame Assembly

Assemble the side frames by first gluing a center rail (C) between two mullions (D). Then glue the two mullions between the top rail (A) and the bottom rail (B) and clamp this assembly with bar clamps at the mullion positions. Turn the assembly over and glue the remaining center rails into the mullions, then attach the stiles (I) and clamp at the rail positions.

While the glue is drying, cut the side panels (K and L) to size and cut a 4-3/4" radius curve on one end of each long panel (K). I shaped the edges of my panels with Sears' V-groove cutters (9 GT 3204) in the moulding head on my table saw. I positioned a wooden auxiliary fence over the moulding head, exposing only half of the cutter so it would mill a bevel. "Jig Journal" (on page 69) shows how I cut this bevel on the curved end of the long panel. You might find a router bit that will mill this detail to your taste.

When the frame is dry, rout the inside edges of all the panel openings with a 3/8" round–over bit.

Before you can assemble the front and back frames, there is some additional detail work to do on their top rails. Lay out and cut the 11" radius curve in the top back rail (E) as shown in Figure 3, then sand it smooth. Cut a 3/4" wide, 1/4" deep dado at 1/2" from the top edge of both top rails (E and G) to accept the dentil inserts (M and N). Assemble the front and back frames, then round over the inside edges of the back frame as you did with the frames for the sides.

To make the dentil inserts, cut some 1/4" × 3/4" stock longer than indicated on the cutting list. On the table saw, set a 1/8" crosscut blade to a depth of 3/32" and make repetitive cuts across the stock at 3/4" intervals. An easy way to do this is to mark 3/4" intervals on the back of the stock and line each one up with a reference mark on your miter gauge. When you cut the inserts to fit, leave the same amount of space past the last kerf at either end so they look symmetrical. Don't, however, cut the inserts until after assembling the carcase.

Now with the saw blade still at 3/32" in depth, position your wooden auxiliary fence up against the blade and rabbet the front corner edges of the stiles on each side frame assembly. This makes a nice detail and also hides any flaws where the end frames join the side frames. I suggest sanding the inside edges of the side frames and all edges of the side panels (K and L) at this time.

Installing Panels

Cut the panel backing boards (O) from your 3/16" hardwood plywood. They should be sized to fit flush with the edges of the side frames—but an inch shy of the top edge so they don't cover up the table iron groove. Lay the backing boards with their good side down and trace the openings from the side frame assembly onto the back of each. Now lay a frame face–down, paint the back with glue, position a backing board on top of the frame without smearing the glue all over, and drive 3/4" flat head wood screws through the backing board and into the frame. Assemble both in this way.

After the glue has had a chance to dry, turn the sides face up and glue the panels

Decorative File Cabinet

Cutting List

Qty	Part	Finished Size			Piece
		T	W	L	
2	A	3/4"	3 1/4"	20 1/4"	top side rails
2	B	3/4"	2 1/4"	20 1/4"	bottom side rails
6	C	3/4"	1 1/2"	6 1/2"	center side rails
4	D	3/4"	1 1/2"	22 1/4"	mullions
1	E	3/4"	3 1/4"	14"	top back rail
1	F	3/4"	2 1/4"	14"	bottom back rail
1	G	3/4"	2"	16 1/2"	top front rail
2	H	3/4"	1 1/4"	16 1/2"	center & bottom front rails
6	I	3/4"	2 1/4"	26 1/2"	side & back stiles
2	J	3/4"	1"	26 1/2"	front stiles
6	K	3/4"	4 3/4"	14 1/2"	long side panels
6	L	3/4"	4 3/4"	4 3/4"	short side panels
1	M	1/4"	3/4"	15 1/4"	front dentil insert
1	N	1/4"	3/4"	12 3/4"	back dentil insert
2	O	3/16"	23 1/2"	26"	panel backing boards
1	P	3/16"	15"	24 1/2"	back panel
1	Q	3/4"	16 1/2"	23 1/2"	bottom
1	R	3/4"	20 1/4"	28 3/4"	top
2	S	3/4"	3"	27"	base sides
2	T	3/4"	3"	19"	base ends
4	U	3/4"	3"	27"	upper trim sides
4	V	3/4"	3"	19"	upper trim ends
2	W	3/4"	3"	28 1/4"	lower trim sides
2	X	3/4"	3"	20 1/4"	lower trim ends
4	Y	1/2"	10 3/4"	24"	drawer sides
4	Z	1/2"	10 3/4"	14"	drawer ends
2	AA	1/8"	13 1/2	23 1/2"	drawer bottoms
4	BB	1/2"	1 1/4"	23"	folder hanging strips
2	CC	3/4"	11 3/4"	16 1/4"	drawer fronts

Supplies

2	pair 24" full extension drawer slides	flat washers
2	drawer pulls	table irons
2	index card holders	Note: drawer slides, pulls, index card holders and table irons are available from: The Woodworkers' Store 21801 Industrial Blvd. Rogers, MN 55379
	#8 × 1 3/4" flat head wood screws	
	#8 × 3/4" flat head wood screws	
	#8 × 1" pan head screws	

(K and L) in place using 1/4" spacers around the edges. Use heavy *weights or* convex cauls to clamp the panels while the glue dries. As an added measure of caution, you might want to drive some screws into the panels through the backing board.

Cut the back panel (P) from the same 3/16" material. It should be sized so that it can be glued to the frame with approximately 1-1/8" space at either edge to allow the side frames to butt in over it and 3/4" at the bottom edge to clear the carcase bottom (Q) as shown in Figure 3.

Drill pilot holes, clearance holes and counterbores for #8 × 1-1/4" flat head wood screws along the bottom edges of all four frames and along the stiles of the front and back frames.

You'll find it's much easier to install the drawer guides before assembling the carcase than it is to put them in after. Determine a standard height above the front frame openings at which to locate the carcase halves of the drawer guides; I positioned the bottom edge of mine 4-1/2" above the frame. I like to attach a narrow strip of 1/2" material to the sides to help with the positioning of the guides; these strips can stay there permanently. Double–check all the measurements pertaining to the installation of this hardware, and don't forget about the 3/4" that the front frame will add when it's attached.

Carcase Assembly

Now cut the bottom (Q) to fit between the frames. Glue and screw the side assemblies to the bottom first, then attach the front and back assemblies to the bottom and to the sides.

Glue up solid stock to make the panel for the top (R), and rip the stock to size for the base pieces (S and T) and the trim (U, V, W and X). You will need an 8' length

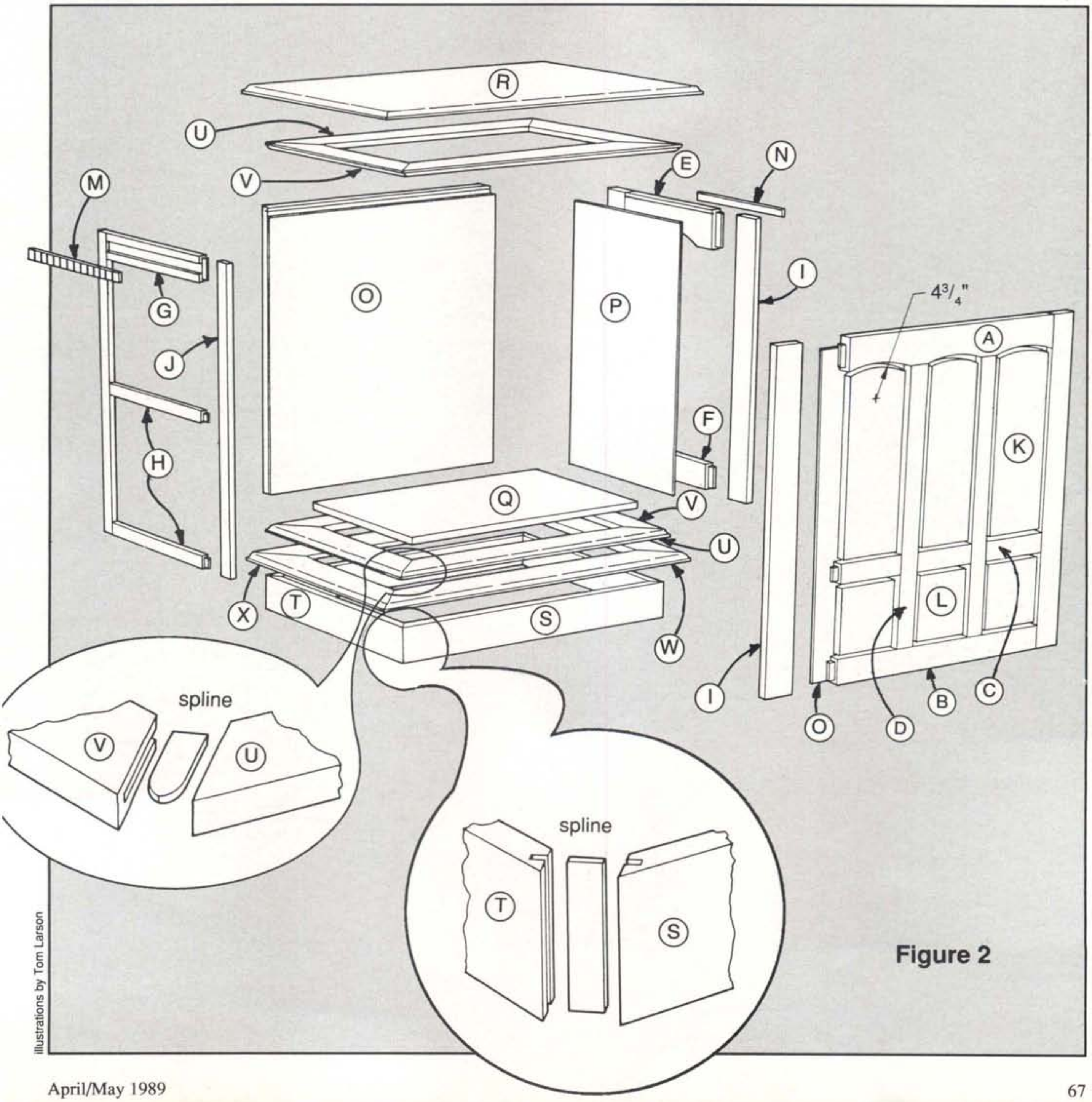


Figure 2

Illustrations by Tom Larson

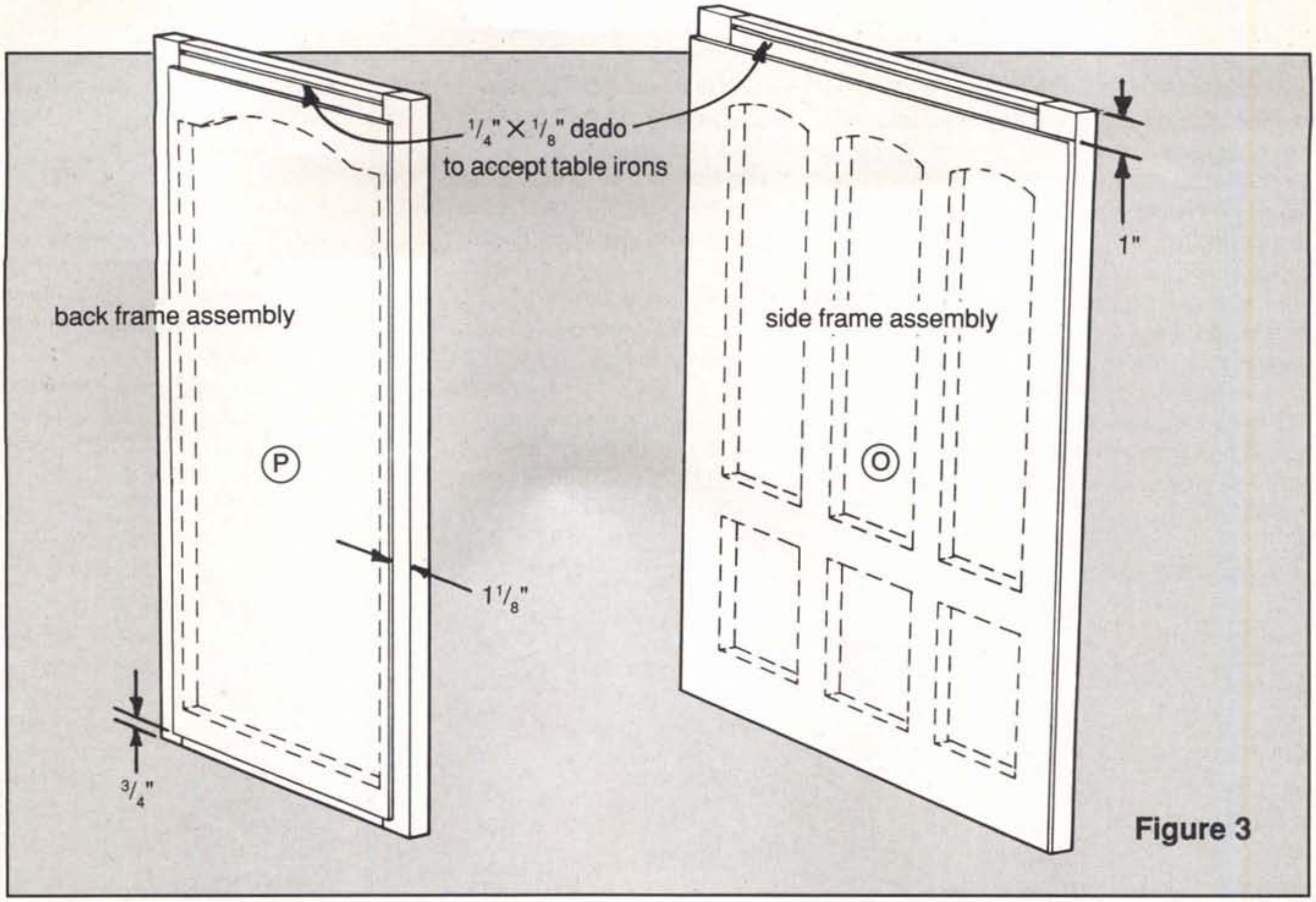


Figure 3

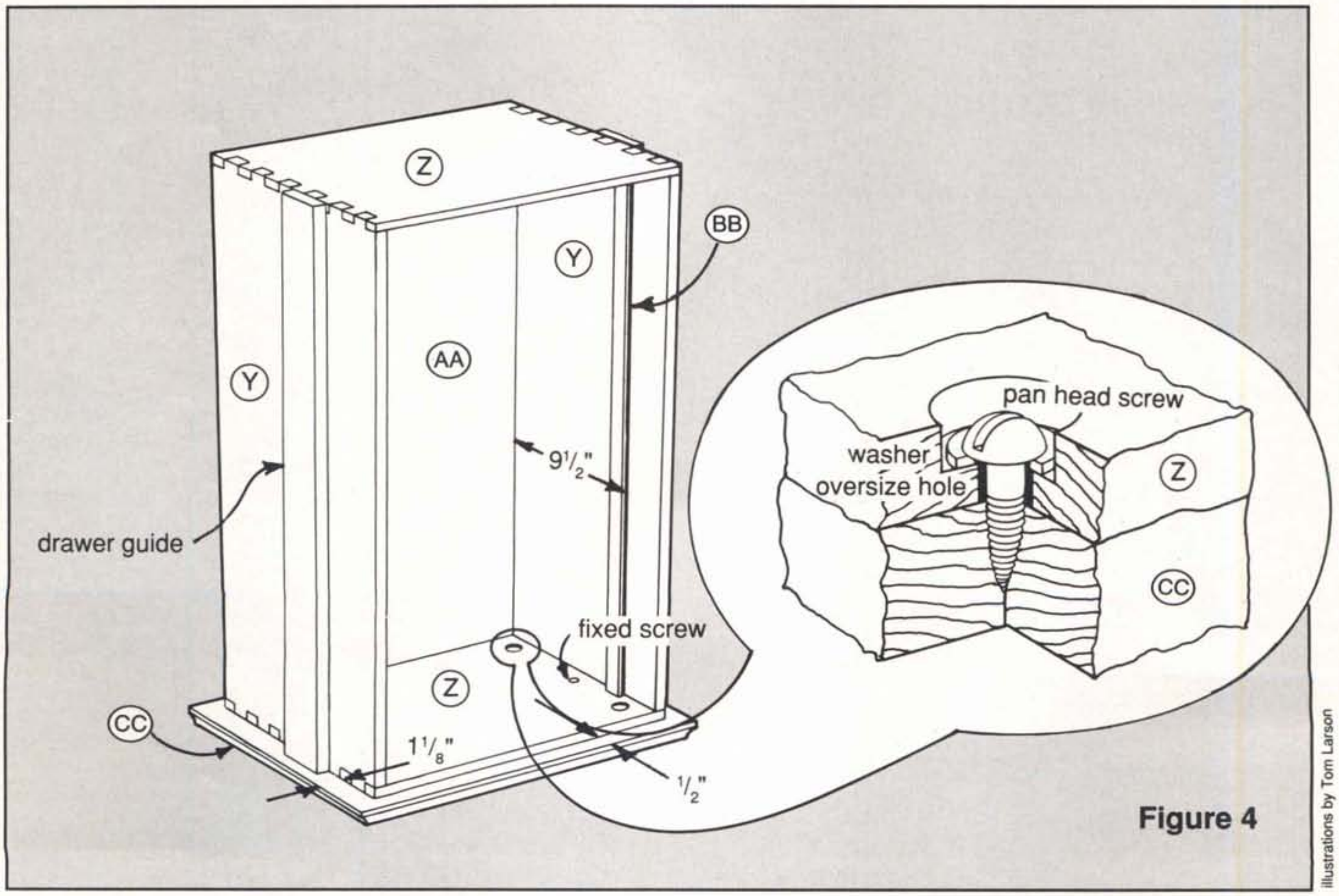


Figure 4

illustrations by Tom Larson

for the base, two 8' lengths for the upper trim pieces (U and V) and a good 9' for the lower trim pieces (W and X). Rout an interesting ogee profile along one edge of the upper trim stock and round over an edge of the lower trim stock. Also rout the profile of your choice around the edges of the top (R), when it's dry.

With the blade set at 45°, miter the base sides (S) and ends (T) to the lengths indicated in the cutting list. Lower the blade and adjust the fence to cut grooves across the end grain of these pieces for splines. Assemble and glue these pieces and make sure to check for square.

Now set the blade back to 90°, change the miter gauge to cut at 45°, and cut the trim material (U, V, W and X) to length with the moulded edge on the outside. Cut stopped grooves in the ends of these pieces so the frames can be splined at the joints (see Figure 2). Glue these four frames together.

Position the lower trim frame on the base with a 5/8" overhang all around and attach it with screws. Then center one of the upper trim frames on top of this assembly and attach it with screws. Attach the other upper trim frame (inverted) to the underside of the top (R) with screws in slotted holes.

Now, finish putting together the carcase by attaching the top with table irons, then driving screws through the base assembly and into the bottom (Q).

Making the Drawers

Each drawer is basically a box made of 1/2" material with a 1/8" tempered hardboard bottom set in a groove with a decorative panel attached to the front. I joined my drawer sides (Y) to the drawer ends (Z) with box joints (see "Making Box Joints on the Table Saw" in *PW* #40, December/January 1988). The dimensions in the cutting list will allow box joints or dovetails, so if you plan to use some other joint, you'll need to adjust your measurements accordingly.

Cut a 1/8" wide × 1/4" deep groove at 1/4" from the bottom edge of the drawer components before you assemble them. Put the bottom (AA) in this groove when you glue the drawer together.

Next cut the file folder hanging strips (BB) to fit snugly inside the drawers and cut a 1/4" × 1/4" rabbet along the top inside edge of each. Attach them to the drawer sides (Y) so that their top edge is 9-1/2" from the bottom of the drawer, using #8 × 3/4" flat head wood screws (see Figure 4).

Attach the remaining halves of the drawer guides to the sides of the drawers according to the manufacturer's instructions. Check as you go to make sure that proper clearances at the bottom and the top of each drawer are maintained.

Glue up solid stock to make the panels for the drawer fronts (CC) and cut them to size. Rout the edges as you please, then place a drawer front face down on your workbench and position the front end of a drawer on top of it. Set the top edge of the drawer 1/2" below the top edge of the drawer front, and center it from side to side (see Figure 4). Tack it in place with some small nails (leaving the heads proud so you can pull them), and try the drawers in the carcase to see how the fronts line up. When you're satisfied with their position, secure the panels with a fixed screw that is centered at each end and drifting screws above and below center (as shown in Figure 4) to allow for wood movement.

I stained my file cabinet with Pratt and Lambert #5-32 walnut stain, with the addition of six teaspoonfuls of burnt sienna per pint, and finished with several coats of clear lacquer. When the finish is dry, attach index card holders and the drawer pulls of your choice. PW

Jig Journal

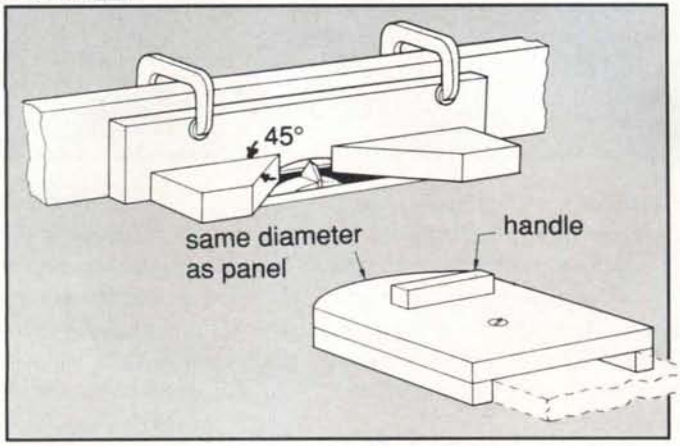
Shaping Curved Ends

This jig is a safe, easy way to control the shaping of curved panels. The idea will work on shapers, on router tables and, as shown here, on a table saw fitted with a moulding head.

Start by making a holder for the panel. Make the top of the holder from plywood stock that is 3" wider than the panel you plan to shape, and round one end to the same radius (4-3/4" for these file cabinet panels). Attach 1-1/2" wide strips of wood to either side to create the "pocket" for your panel stock. A small block of wood attached to the top of the holder serves as a handle.

Make two guide blocks for the fence from some 2 × 4 scrap cut at a 45° angle. With the machine turned off, place the curved end of the holder against the auxiliary fence, and position the angled ends of the guide blocks like wedges on either side so it's supported at three points. Mark the location of the guide blocks and secure them to the wooden fence.

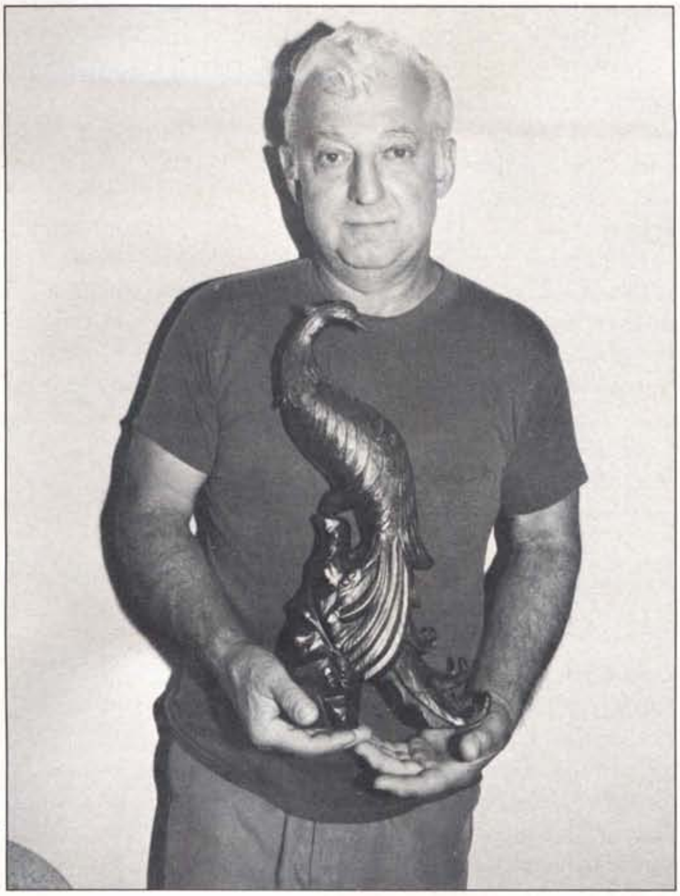
With the end of your panel stock already rounded and sanded, place it face down in the holder so the rounded edge is flush with the edge of the holder. Secure it in place with a screw driven through the holder and into the back of the panel. Mill the edge by rotating the stock and the holder between the guide blocks. PW



A Woodcarver Who Shares What He's Learned

by Shirley Stebbins

Frank Hayson began woodcarving on a neighbor's whim nearly thirty years ago. When a neighbor mentioned that she wanted some wall plaques of birds, Hayson decided to give it a try. Since he had never carved before, he found that part difficult, but he drew on his experience as an artist for the painting of the project. "The plaques were crude," states Hayson, "but she was satisfied with the results. And that set led to another and then another." That was the beginning of his commissioned carving.

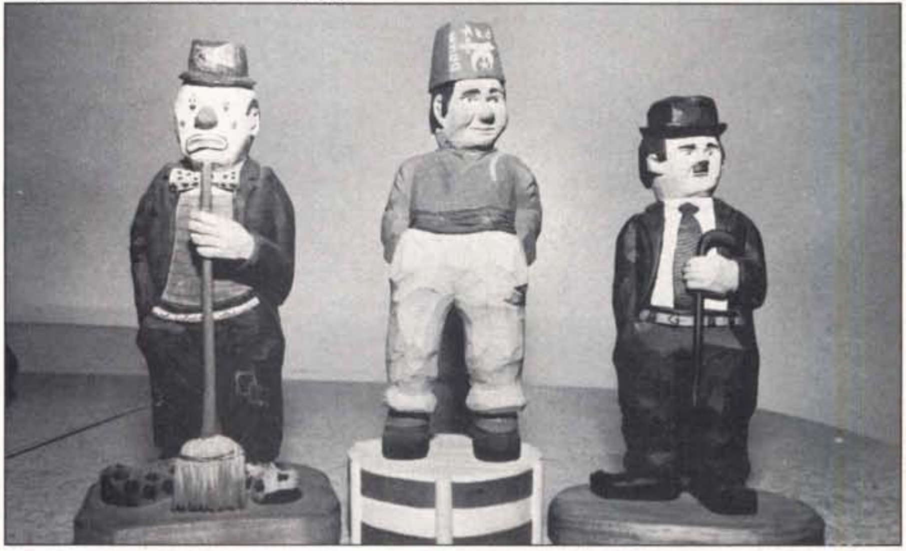


photos by the author

Frank Hayson, displaying his golden pheasant, a first place ribbon winner at the Great Mississippi Valley Fair.

Hayson started out carving mostly animals and birds, but his specialty has since become caricatures of people. "Caricatures fascinate me," confides Hayson. "It's a challenge to try to make a carving look like a certain person, to have the same facial characteristics. And I never can get two carvings of the same person to look exactly alike. Inevitably there will be differences." Hayson's carving of Charlie Chaplin does capture the comedian's dapper look, while his Jimmy Carter sports the famous smile. Much of his commissioned work has been human figure carvings.

The clown, the Shriner, and Charlie Chaplin are just three of Hayson's large figurine collection.



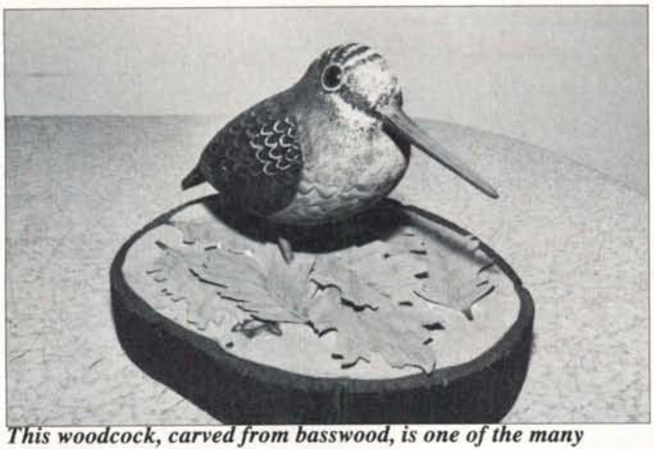
To begin his caricatures, Hayson often uses a picture, a ceramic figure, or a pattern to copy. Then he roughs out the figure on a band saw and does the carving using only a knife. He prefers to paint his carvings using watercolor because it allows him to shade correctly and it dries fast.

Hayson uses basswood for the carvings that he intends to paint, but butternut is a favorite for unpainted projects. To bring out the beauty of the wood on a finished carving, he sands it and gives it a coat of varnish, and then rubs with steel wool. He varnishes again, repeating the process four times. "The more I varnish and steel wool it, the smoother it gets," states Hayson. "Then I finish it with a coat of Johnson's wax. The wax gives it a nice shine and protects it."

His largest, most unusual, and probably best known carving is the four–foot diameter Seal of Duluth which hangs in the mayor's office. It is carved and painted with 200 separate pieces of wood mounted on a plywood circle. The frame consists of five pieces joined to form a circle with 163 grooved notches. "It took me at least 51 hours and three sleepless nights," jokes Hayson, "as I tried to figure out how I was going to construct it."

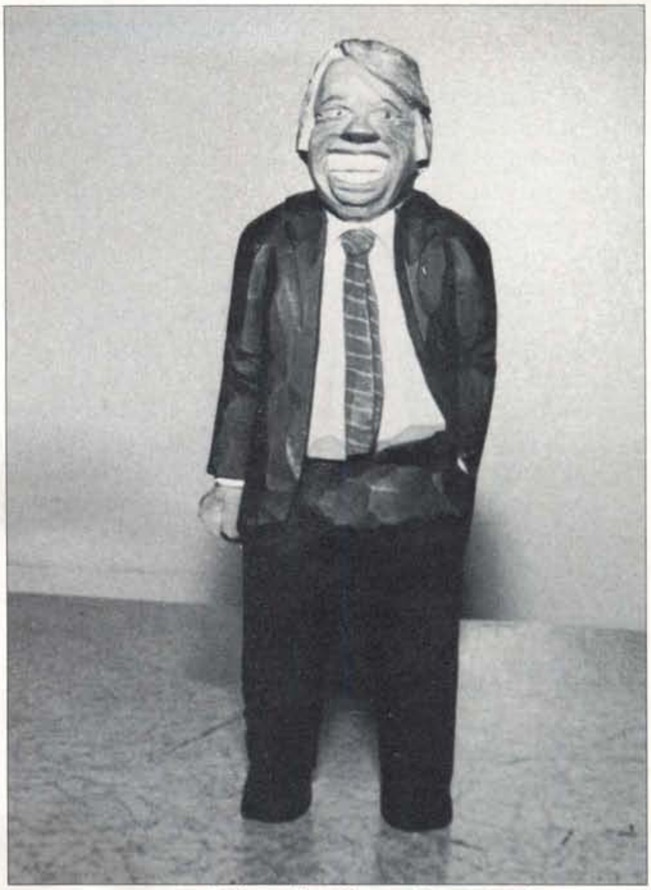
Hayson has won many ribbons in his

***Shirley Stebbins** is a writer from Sturgeon Lake, MN.*



This woodcock, carved from basswood, is one of the many birds Hayson has carved.

Hayson often does commissioned figurines, such as this barber, which is an original design.



This smiling Jimmy Carter is a fine example of Hayson's caricatures.

This carving of a man hauling birch logs is an original design reminiscent of earlier days.

years of carving, including a first place ribbon for his carving of a golden pheasant at the Great Mississippi Valley Fair at Davenport, Iowa. Some years ago, he was also asked to donate some carvings to the National Woodcarvers Museum in Monument, Colorado. He is now a lifetime member of the museum and proud to have his carvings shown there.

When Hayson first moved to Duluth, he and six others formed a group called the Northwoods Woodcarvers Club. The meetings were very helpful to him in learning how to carve and experiment with different kinds of carving. The club has since grown to over fifty members. They do many carving shows each year to expand the public interest in the art of carving. "What's really interesting about our club," says Hayson, "is that everybody does something different. Each individual has his own specialty, style and taste."

Hayson often carves under the poplar tree in his yard, and it's not unusual to see a group of children gathered around him, watching and learning. But this isn't the only way that Hayson shares his expertise. For more than ten years now, he has been teaching woodcarving for the adult community education program in Duluth.

He has found this to be a very rewarding experience. "I've met people from all walks of life, and some of the people that I've taught have gone on to teach woodcarving themselves." Hayson suggests a small carving in the round, such as an owl or shoe, as a good beginning project.

Recently Hayson was nominated for Community Education Teacher of the Year in Duluth. This honor points out the appreciation felt for Frank Hayson who is willing to share his knowledge, and keep the art of woodcarving alive and well in Northern Minnesota. PW

Tests & Comments

by Hugh Foster

Compound Miter Saws

I had seen enough of electric miter boxes to believe that they didn't really provide enough service to justify their expense. Besides, for years I have been quite happy cutting my mitered pieces roughly with my Uni–Saw, and then trimming them to precision with my Lion Miter Trimmer (reviewed here in *PW* #38 August/September, 1987), and didn't feel the need for a special saw to do these chores. I have, however, often wished I had the room in my small shop for a radial arm saw along with my table saw and other tools. Cutting off a couple feet from a sixteen–foot plank can be a problem in that 12' × 28' shop. If the plank were more than about 4" wide, a "chop box" wouldn't really be enough to do this job.

Two companies must have heard me, for both DeWalt and Hitachi have introduced crosscutting miter saws. Neither will really replace a radial arm saw, but if you're as short of space as I am, one of these might nicely satisfy your need for a cut–off saw while, at the same time, giving you a tool that will cut precise compound miters. The DeWalt Crosscutter will cut a piece 2-1/4" thick by 9-7/8" wide and the Hitachi will cut a piece 2-9/16" by 12" wide. These are not terribly wide cuts, but they are enough to crosscut just about all but the ever scarcer wide planks of Honduras Mahogany.

Though I tested the Hitachi saw in their conference room in Norcross, GA, rather than in my own shop, I found it to be a most impressive tool. I didn't get to generate a lot of sawdust with it, but I "dummied" it through its paces. The Hitachi tool appears to have superior specifications to the DeWalt in several important respects, but overall I would rate them about equal, both vastly superior to the "standard" power miter box and both rather more accurate and, hence, more useful than any sample of the Delta "Sawbuck" that I have had occasion to use.

The list price of the Hitachi is $859 and of the DeWalt is $770, but the discount price of each is nearer (at some stores even under) $500. Both can be used as a straight, short–stroke radial saw, as a chop box, or in combination. Either could even be used as a chop box while locked way out at the end, for mitering just a portion of the edge of a wide piece.

The Hitachi's 9.5 amp, 1050 watt ball bearing motor turns the 8-1/2" blade at 4900 RPM and 97 dB; the unit is shut off at 104 dB by an electrical brake. The DeWalt also runs at 97 dB, but its 11.5 amp ball bearing motor drives its blade at 6500 RPM. Both makers supply a very clean cutting 8-1/2", 24–tooth, negative rake, carbide blade as standard equipment but they offer even more toothsome configurations as optional equipment. The DeWalt weighs in at a very portable 32 pounds, and the Hitachi, at 37.4 pounds, is 16.8% heavier. By the look of things, most of that extra weight is in reinforcement and the couple of inches of

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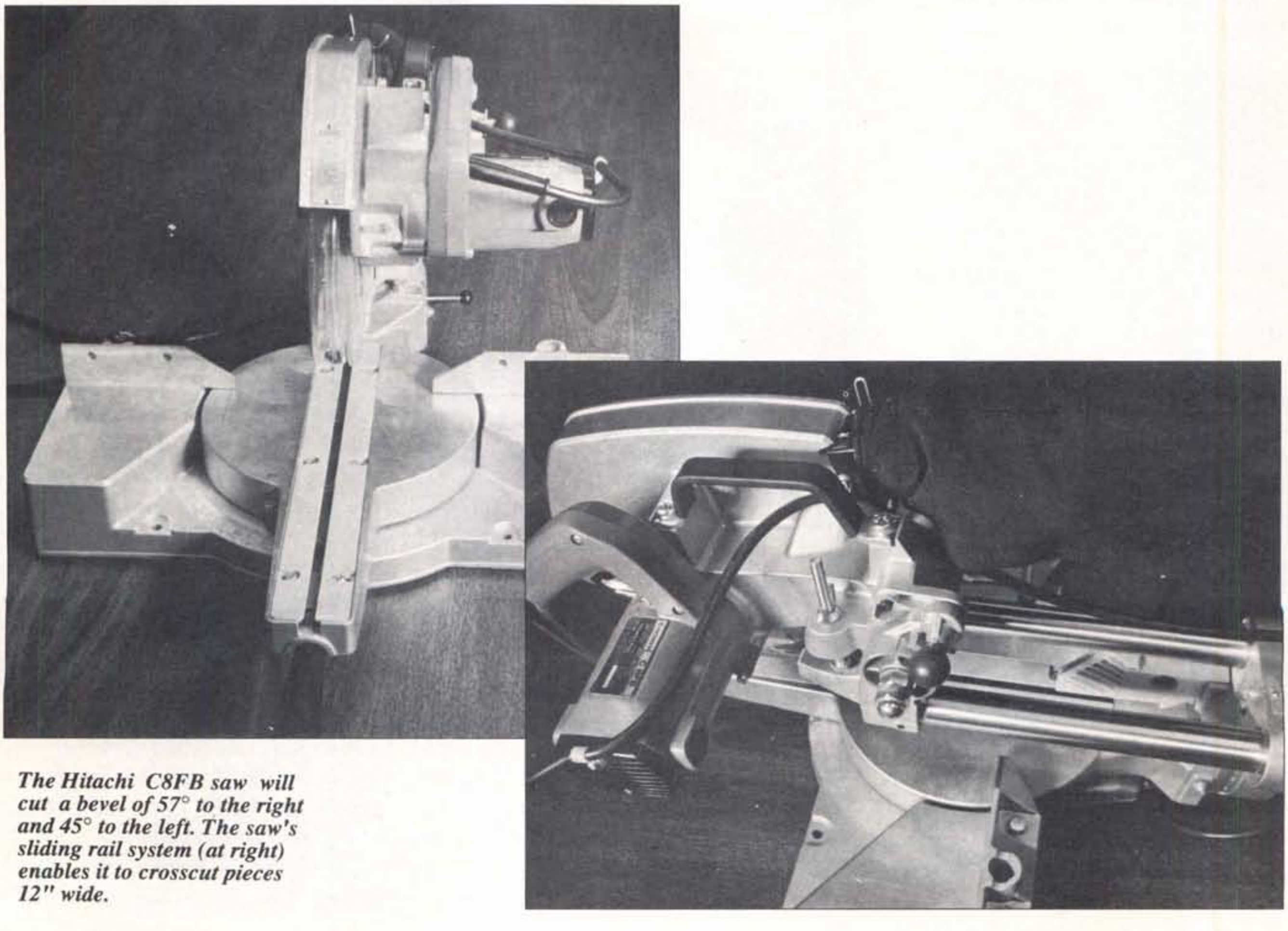
***Hugh Foster** is a part-time furniture designer/builder in Manitowoc, Wisconsin.*



The Hitachi C8FB saw will cut a bevel of 57° to the right and 45° to the left. The saw's sliding rail system (at right) enables it to crosscut pieces 12" wide.

extra cutting length.

The castings on the Hitachi C8FB are extremely well made, in fact better than I have ever before seen on an Asian tool. The quality appears equal to, or perhaps even superior to that of top–of–the–line American or European tools. I didn't test the units in the same room, so my vision may be clouded by time and space, but the DeWalt I had been using with great pleasure in my shop seemed far less wonderful after I experimented with the Hitachi in the conference room of Hitachi's headquarters. Is the Hitachi superior? I can't say that with any certainty. After all, the DeWalt Crosscutter saw is very satisfactorily in place in my shop, and as much as I appreciate using only the best, I have no burning desire to rush right out and replace it.

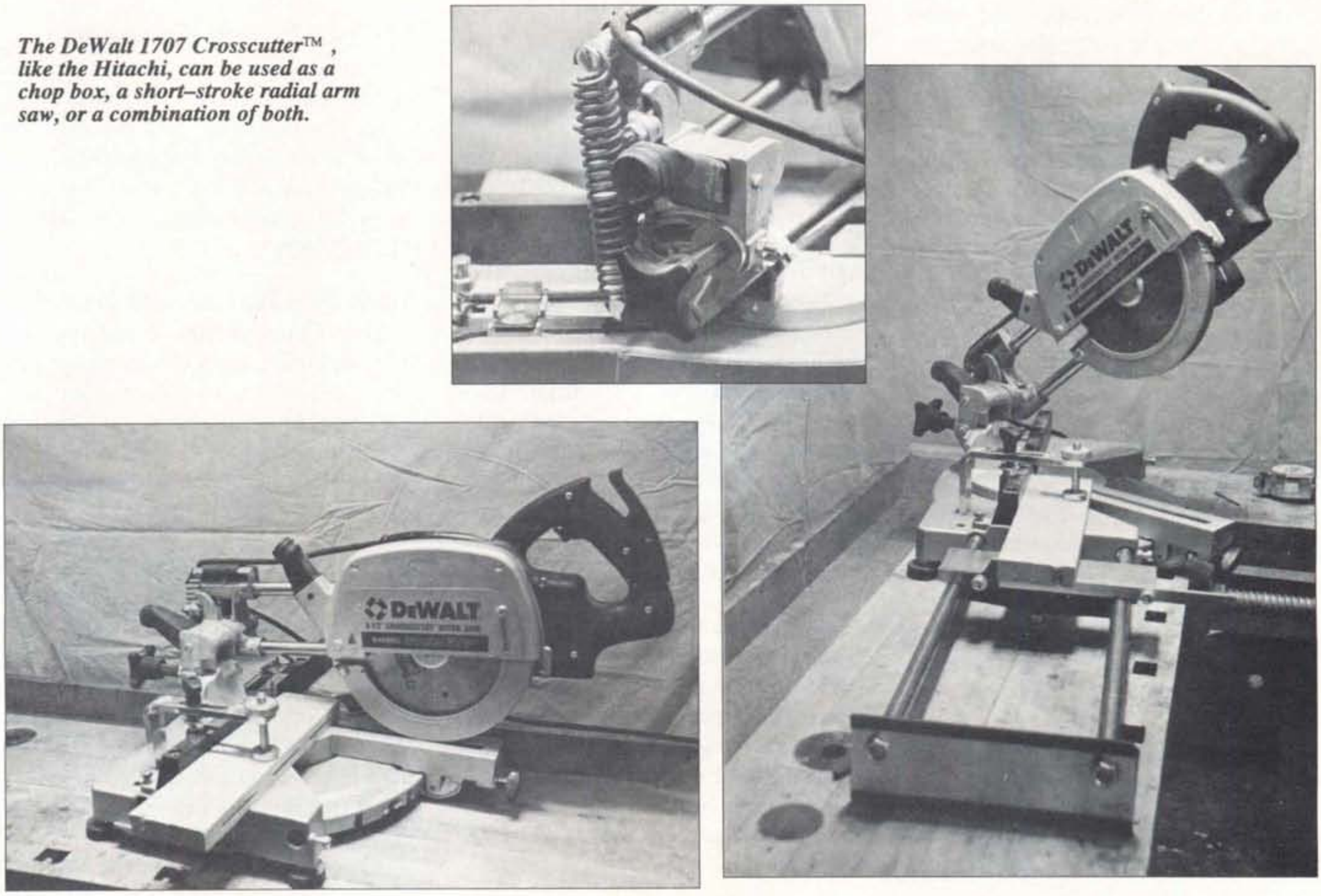
The Hitachi's manual is superior—not just to DeWalt's, but to most other manuals. The Hitachi's ergonomics are superior to those of most other chop boxes. For instance, a spindle lock provides easy, one–wrench blade changing, while the DeWalt requires both a spanner and an Allen wrench. In the safety category, the DeWalt Crosscutter makes up for some of this inconvenience, for its guard is in place except when retracted by the operator's trigger hand. The Hitachi's see–through safety cover is better than most; but as time goes by, one might be more likely to remove it than its DeWalt counterpart. In the tradition of Elu and other West German tools, the DeWalt offers a more interesting range of useful accessories, including guide rods, material clamps and positive length stops. While one could readily improvise these for the other tool, the engineering of the Crosscutter system seems more completely thought out. Indeed, these extensions, which permit my DeWalt saw to have a seven–foot (or even longer) bed with only a few moments of adjustment, are among saw's main virtues. Since the saw will probably be stored on a shelf when not in use, I much prefer this to having to build the saw into a counter.

While DeWalt's accessories are generally better, both these saws offer the most important accessory: They will accept a hose attachment that permits you to connect the tool to a shop vac or other dust extraction system.

The Hitachi cuts 57° right, 45° left, and has 47° lateral movement for compound mitering. It can crosscut through a 2-9/16" × 12" board. The DeWalt cuts 45° in each dimension, crosscutting through 2-1/4" × 10".

Both these tools are workhorses built with precision, flexibility, and portability in mind. They have the widest cutting capacity of any power miter saw. Their telescoping heads, electronic brakes, and rugged die–cast bases make them comfortable and safe. While neither is likely to replace the Lion Trimmer for precision mitering, their virtues make either far more commendable than the standard chop box.

__The DeWalt 1707 Crosscutter™ , like the Hitachi, can be used as a chop box, a short–stroke radial arm saw, or a combination of both.__



Calendar

Events of Interest to Woodworkers

*If your group is having an event you would like other woodworkers to hear about, please send us all pertinent information at least three months before the opening date. We will publish it for you in **Calendar** free of charge.*

April 2—3, St. Anthony, MN

The Minnesota Woodcarver's Association will hold its 24th annual show at the Apache Plaza Mall in St. Anthony, MN. For more information contact: The Minnesota Woodcarver's Association, 11055 Xylon Ave. N., Champlin, MN 55316, (612) 421-7535.

April 2—May 6, Portland, OR

An exhibition featuring the work of the textile artist Lia Cook will be held at the Contemporary Crafts Gallery, 3934 SW Corbett Ave., Portland, OR 97201. Gallery hours are Tuesday—Friday 11-5, Saturday 12-5 and Sunday 1-5.

April 6—30, Seattle, WA

The work of furniture maker Ross Day will be presented in "Elegant Simplicity" at the Northwest Gallery of Fine Woodworking, 202 First Avenue South, Seattle, WA 98104 (206) 625-0542.

April 6—12, Portland, OR

An exhibit entitled "Turned Wood" will open April 6 at the Oregon School of Arts and Crafts, and a seminar entitled "Innovative Wood Turning" with Dennis Stewart will be given on April 9. For exhibit hours and seminar time, contact: Becky Banyas The Oregon School of Arts and Crafts, 8245 SW Barnes Rd., Portland OR 97225, (503) 297-5544.

April 7—9, Nashville, TN

The Tennessee Woodworking Show, featuring machinery, tools, supplies, demonstrations, seminars and workshops for woodworkers will be held at the Nashville Convention Center, 601 Commerce Street, Nashville, TN. For more information call: (213) 477-8521, or 1(800) 826-8257.

April 7—9, Buffalo, NY

The 1st annual Buffalo edition of the World Woodworking Show will be held at the Erie County Fairgrounds, Hamburg, NY. The show is sponsored by the Woodworking Association of North America. Admission is $3.00 for WANA members, $6.00 for the general public, and includes seminars on day of admission. For more information contact: WANA, Box 706, Plymouth, NH 03264, 1(800) 521-7623, or (603) 521-3768.

April 8—15, Arcata, CA

A boatbuilding class entitled "Building the Petaluma, a 19-1/2' Recreational Rowing Shell" will be given by Simon Watts. For more information contact: Ann Smith, 240 12th St., Arcata, CA 95221, (707) 826-1544.

April 10—28, Penland, NC

A workshop in timber framing will be co-sponsored by Riverland Timber Framing and Penland School. The skeleton of a new structure will be built as part of the workshop, using timber framing techniques, with students participating in the construction. For more information contact the Registrar, Penland School, Penland, NC 28714, (704) 765-2359.

April 14—16, Atlanta, GA

The Atlanta Woodworking Show featuring machinery, tools, supplies, demonstrations, seminars and workshops will be held at the Lakewood Fairgrounds, 2000 Lakewood Avenue, Atlanta, GA. For more information call: (213) 477-8521, or 1(800) 826-8257.

April 20—23, Washington, DC

The Women's Committee of the Smithsonian Institution will hold its 1989 Washington Craft Show in the Departmental Auditorium, 1301 Constitution Ave. N.W., Washington D.C. One hundred craftsmen have been selected from among more than 1200 applicants nationwide to participate in this nonprofit juried show and sale. For more information call: (202) 357-2700.

April 21—23, Hartford, CT

The Connecticut Woodworking Show, featuring machinery, tools, supplies, demonstrations, seminars and workshops for woodworkers will be held at the Hartford Civic Center, One Civic Center Plaza, Hartford, CT 06103. For more information call: (213) 477-8521, or 1(800) 826-8257.

April 22—23, Madison Heights, MI

The Metro Carvers of Michigan will hold their 9th Annual Woodcarving Show at the United Food Workers Hall, 876 Horace Brown Dr., Madison Heights, MI, featuring carvings and supplies. For more information contact: Metro Carvers, 25400 W.14 Mile, Franklin, MI 48025

April 22—23, Flemington, NJ

The Flemington Crafts Festival will be held at the Flemington Fairgrounds, Flemington, NJ. The show features 200 professional artisans, demonstrations, and food. For more information contact: United Craft Enterprises, Ltd. Box 326, Masonville, NY 13804.

April 22, Bellingham, WA

A carving demonstration will be given byMary Strapp at Artwood, a co–op gallery of seventeen active woodworkers displaying their own work and that of other area craftsmen. For more information, contact Artwood, 1000 Harris Ave., Bellingham, WA 98225, (206) 647-1628.

April 22-29, San Francisco, CA

A boatbuilding class entitled "Building the Sea Urchin, a Traditional Nova Scotia Rowing Skiff" will be given by Simon Watts at the National Maritime Museum Association, Building 275, Crissy Field, San Francisco, CA 94129, (415) 929-0202.

April 28—30, Chicago area, IL

The Chicagoland Woodworking Show featuring machinery, tools, supplies, demonstrations, seminars and workshops for woodworkers will be held at the Odeum, 1033 N. Villa Ave, Villa Park, IL 60181. For more information call: (213) 477-8521, or 1(800) 826-8257.

May 5—7, Cleveland, OH

The Greater Cleveland Woodworking Show featuring machinery, tools, supplies, demonstrations, seminars and workshops for woodworkers will be held at the Cleveland Convention Center, 1220 East 6th Street, Cleveland, OH. For more information call: (213) 477-8521, or 1(800) 826-8257.

May 6—13 Charlotte, MI

A boatbuilding class entitled "Lofting

and Building the Herreschoff Pram" will be given by Simon Watts at 500 East Broadway Highway, Charlotte, MI 48813, (517) 543-5325.

May 9—12, Toledo, OH

A workshop in "Spray Finishing Technology" will be conducted by Bowling Green State University and the DeVilbiss Co., including sessions on equipment, material selection, and spray finishing techniques for automotive, furniture, and industrial applications. It will be held at the Technical Training Center of the DeVilbiss Co. World Headquarters in Toledo, OH. For more information contact Department of Technology Systems, College of Technology, Bowling Green, OH 43403-0301, (419) 372-2439.

May 13—29, Mendocino, CA

The Eighth Annual College of the Redwoods Furniture Show of students' work will be held at the Highlight Gallery, 45052 Main St., Mendocino, CA 95460, (707) 937-3132.

May 20—27, Sutton's Bay, MI

Building the sailing pram "Sea Lion" will be taught by boatbuilder Simon Watts at Lois Bahle's Store, Main Street, Sutton's Bay, MI 49682, (616) 271-3640.

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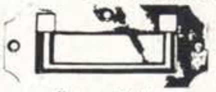

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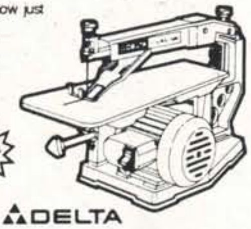

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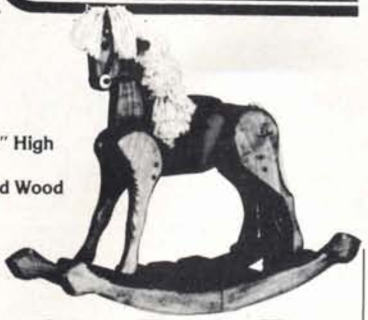

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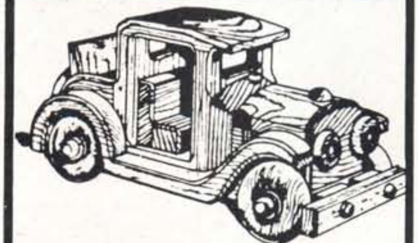

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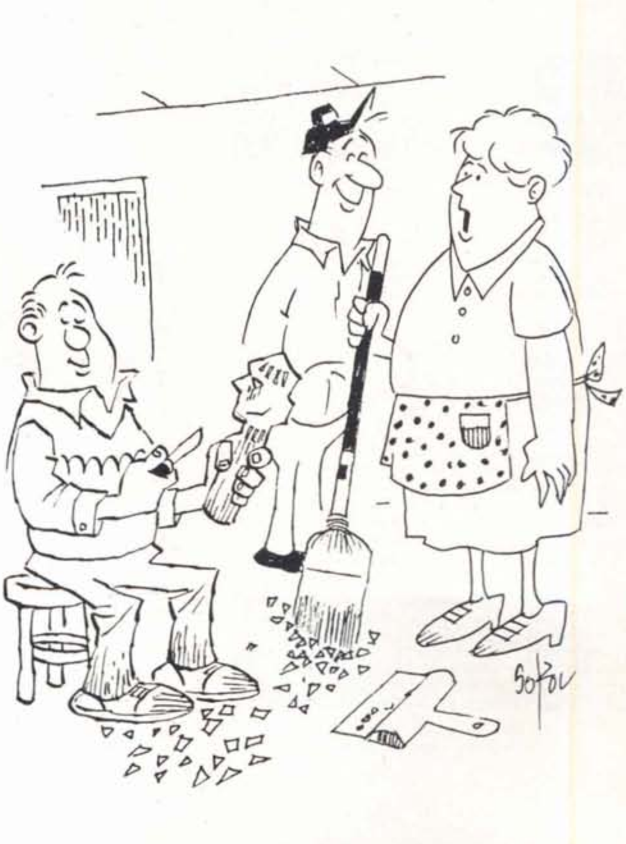


"You're right—I *am* whittler's mother!"

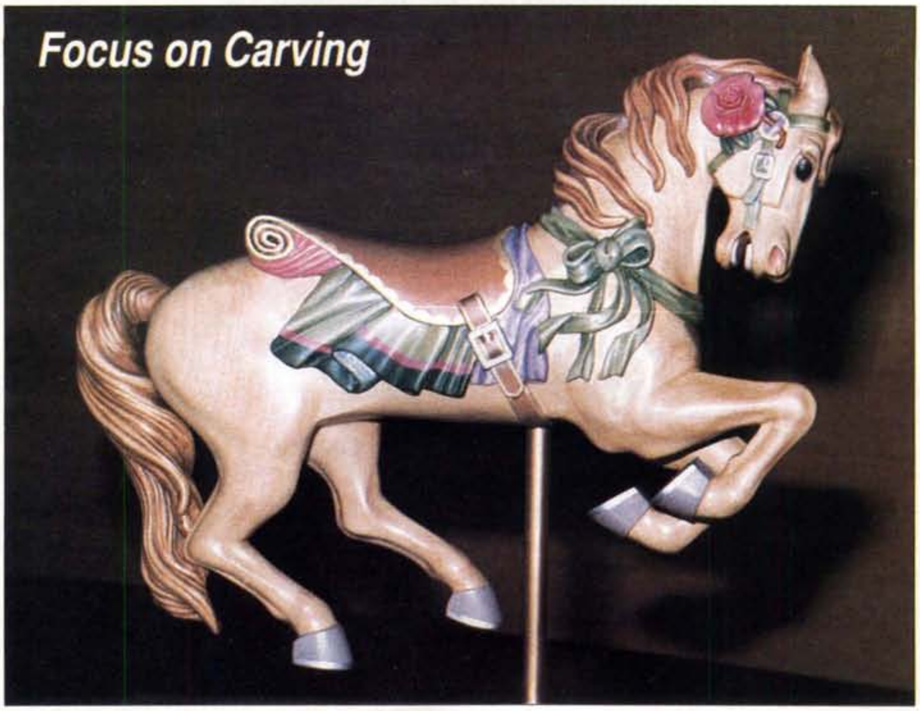


photo by the author

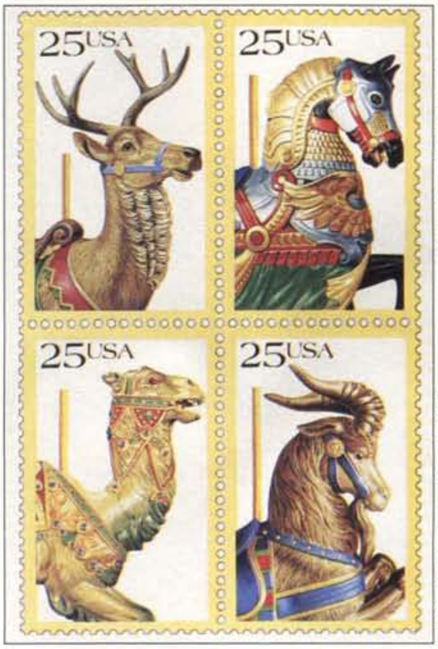
Carving Carousel Animals

by William H. McMaster

The carousel has always been a favorite amusement attraction for both adults and children. The original carved wooden animals have now become collector's items of American folk art. Many of the carousels still operating today have had their original wooden animals replaced by fiberglass copies. Originals are being restored and repainted and are highly valued among collectors. One sold recently at an auction in New York for $101,750.

The Post Office's recent issue of four carousel animal stamps in their folk art series has helped focus attention on this enchanting art form. The carving of miniature carousel animals has become very popular with woodcarvers. In the next few articles we will discuss the art of carousel carving and give you several patterns with which to start carving your own collection of these wonderful figures.

Although originating in Europe, the carousel reached its highest development as an art form in the United States where the carving was done mainly by immigrant European woodcarvers. The origin of the carousel can be traced back to the war games of twelfth century horsemen in Arabia and Turkey. These games consisted of mounted contestants attempting to spear rings with a lance while riding at a full gallop. The returning Italian crusaders brought the sport back to Italy where it was called "Carosello" meaning "little war". By the seventeenth century, these games had evolved into lavish displays of horsemanship with both the horse and rider fully costumed. Young noblemen trained for these games on carved horses suspended from rotating devices. These training devices were eventually copied to make a recreational ride for adults, and the carousel as we know it was born.



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Carousel animal comemorative stamps

By the early 1800's the carousel had become an exceedingly popular form of entertainment in Europe. With the introduction of the steam engine around 1865, it became possible to add more horses and provide a more exciting ride. This led to larger and more highly decorated carousels with elaborately carved horses and menagerie animals. Carousel figures remained stationary, however, until an Englishman named Savage invented the jumping mechanism in 1888 which gave us the up and down motion on today's carousels.

The carousel was introduced to our country in 1860 by Gustav Dentzel who had immigrated from Germany at the age of twenty. By 1867 he had converted his cabinet shop to building carousels full time. Other European immigrants with carving experience also turned to carousel carving, and by the end of the century the industry was flourishing. By 1900 there were sixteen carousel carving shops in America, each producing from three to forty carousels a year. Unfortunately, the Great Depression led to the demise of the hand–carved carousel industry.

***William H. McMaster** is Chief of the Education Division of the California Carvers' Guild. His "Focus on Carving" is a regular feature in* PW.

In the United States, carousels rotate counter–clockwise, presenting the right side to the viewer. With the carousels rotating in this direction, the rider's right hand can reach for the brass ring that many of the early carousels had. This side was traditionally more elaborately carved and is known as the "romance" side. However, in England the carousels run clockwise so that the rider can mount the animal on his left side which is the correct equestrian procedure.

The woods used for carving were generally Poplar, Basswood, and Apple. The horses measured from 3' - 5' long and were approximately 11" wide. They were laminated for strength and only the master carver did the heads. The horses came in three primary poses: standers with at least three feet on the floor, prancers with the back two feet on the floor and their front legs in the air, and the jumpers with all legs elevated. The animal's proportions generally follow those of the real animal; however, their bodies are customarily of uniform thickness and the muscles and nostrils over–emphasized. The carousel carvers liked to emphasize the muscles, tendons, and bone structure. It is common to see flaring nostrils, prominent teeth, and straining heads.

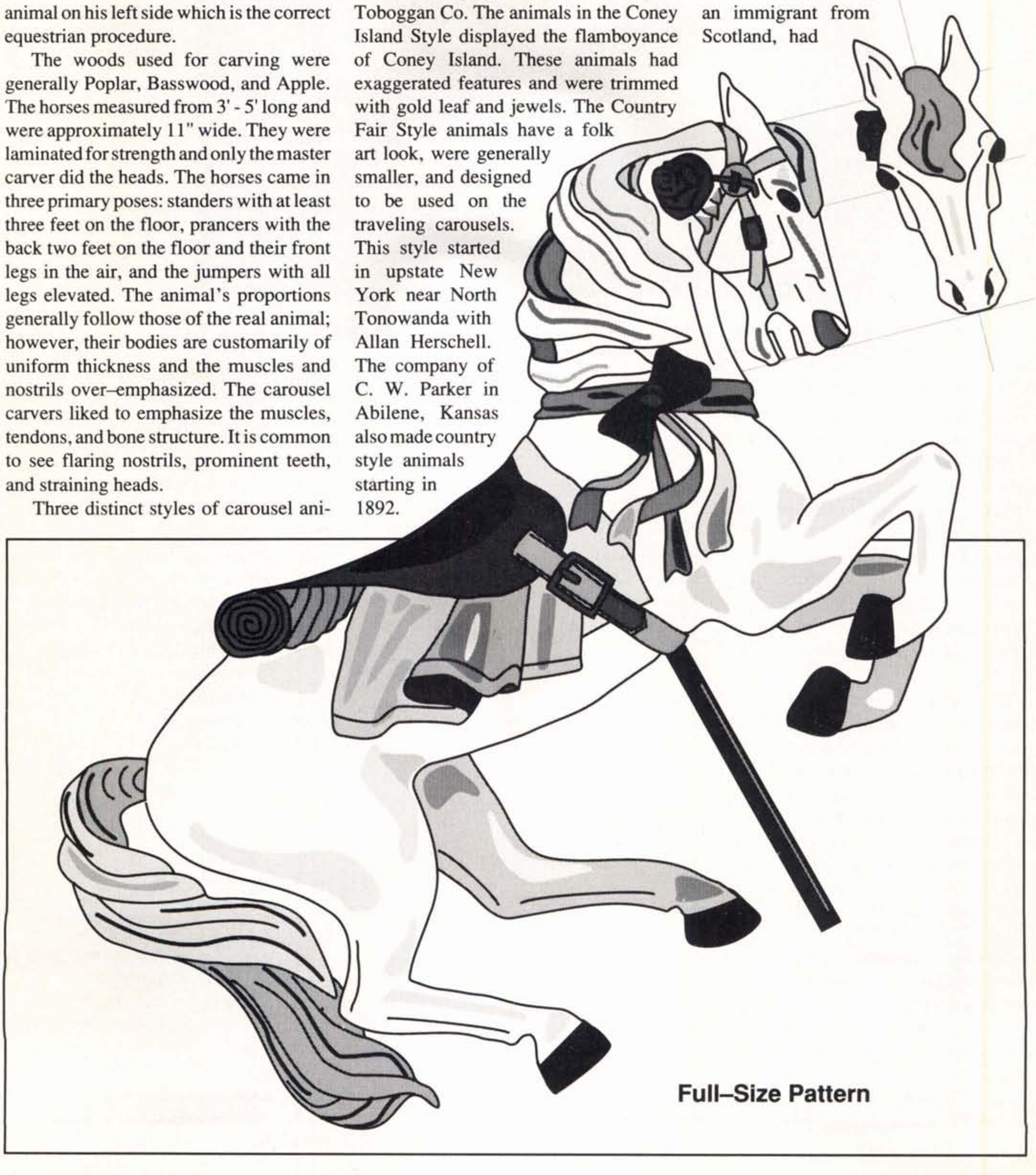
Three distinct styles of carousel animal carving can be identified: The Philadelphia Style, The Coney Island Style, and The Country Fair Style which were each developed in different geographic regions. In this series of articles we will present patterns for each of these styles.

In the Philadelphia Style the emphasis was on realism and elegance. These designs were dominated by the Gustav Dentzel company and the Philadelphia Toboggan Co. The animals in the Coney Island Style displayed the flamboyance of Coney Island. These animals had exaggerated features and were trimmed with gold leaf and jewels. The Country Fair Style animals have a folk art look, were generally smaller, and designed to be used on the traveling carousels. This style started in upstate New York near North Tonowanda with Allan Herschell. The company of C. W. Parker in Abilene, Kansas also made country style animals starting in 1892.

Rosebud

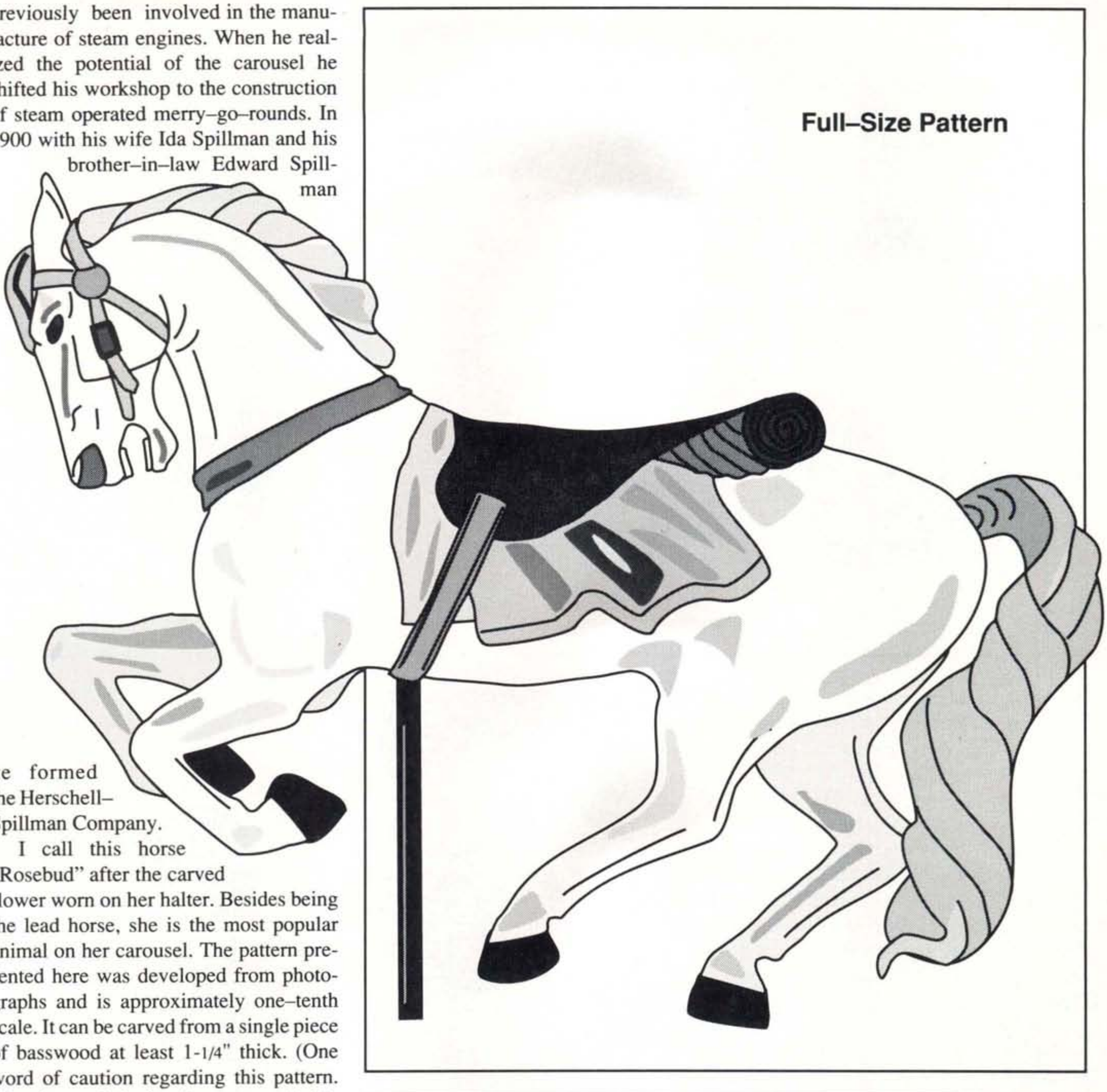
Our first carousel pattern for this series is based on the lead horse on the Tilden Park Carousel located in Berkeley, California. This carousel was built by the Herschell–Spillman Company about 1912, was restored by the Redbug Workshop, and is still in operation with its wooden animals.

Allan Herschell, an immigrant from Scotland, had



Full–Size Pattern

previously been involved in the manufacture of steam engines. When he realized the potential of the carousel he shifted his workshop to the construction of steam operated merry-go-rounds. In 1900 with his wife Ida Spillman and his brother-in-law Edward Spillman he formed the Herschell-Spillman Company.


Full-Size Pattern

I call this horse "Rosebud" after the carved flower worn on her halter. Besides being the lead horse, she is the most popular animal on her carousel. The pattern presented here was developed from photographs and is approximately one-tenth scale. It can be carved from a single piece of basswood at least 1-1/4" thick. (One word of caution regarding this pattern. The views of the head are top and side views and are your patterns for the carving. In actuality, the head is tilted and rotated so the photograph of my version does not present the head as shown in the pattern.) This pattern is intended to be a copy of the original horse, so study it carefully to understand the style used by the carver. Some of the characteristics of this company's style are the very intricate mane, the flat-topped saddle, the notably pointed rump of the horse, and her bulging muscles.

The first step is to make a working pattern by tracing the drawings presented here onto a piece of clear acetate. This will

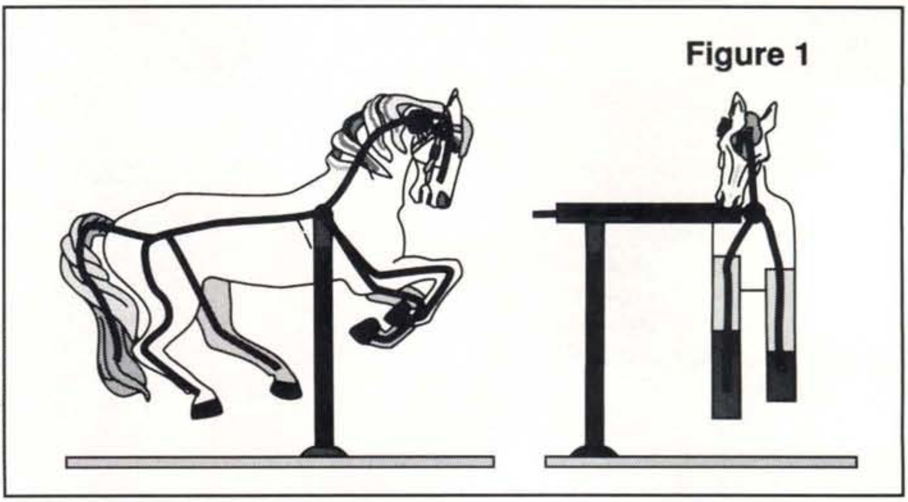


Figure 1

Illustrations by the author

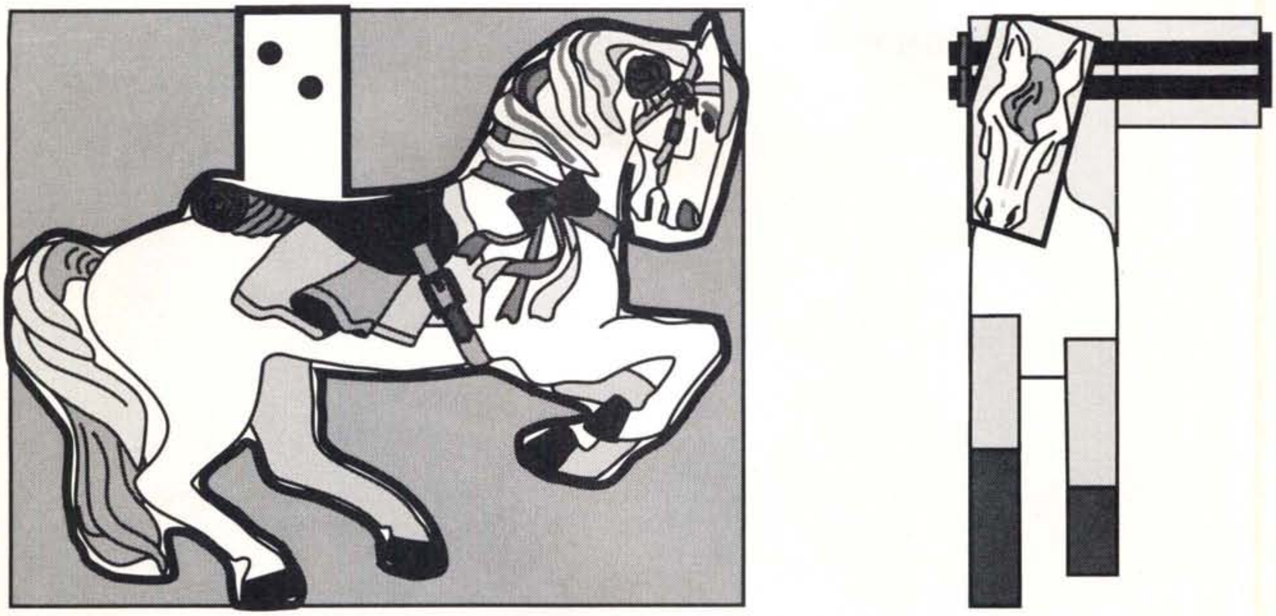


Figure 2

then guide your progress as you carve, since you can look through it to locate the details. If you have not carved horses before, then you will find it worthwhile to first construct a clay model. This pattern requires an armature for the clay model and Figure 1 shows how to construct one from plumbing pipe and wire obtained from your local hardware store. The head of this horse is tilted and rotated, so a clay model will be a great help in getting the head started properly. Details for the methods of clay modeling were given in the June/July 1988 issue of *Popular Woodworking* (#43) and the method for starting the head was in the April/May 1987 issue (#36).

Figure 2 shows how to bandsaw the pattern from the block of wood. Notice that plenty of extra space is left around the head. This makes sure you have enough wood to rotate and tilt the head as shown in the front view of the pattern. You will need a method for holding the piece in your vise, so a holding tab is provided for that purpose. The optimal place for it is at the rear of the saddle above the cantle. There are many methods for using this tab. For my carving, I bolted a small block to the tab as shown. This extension is held in the vise and can be changed from side to side depending upon where on the

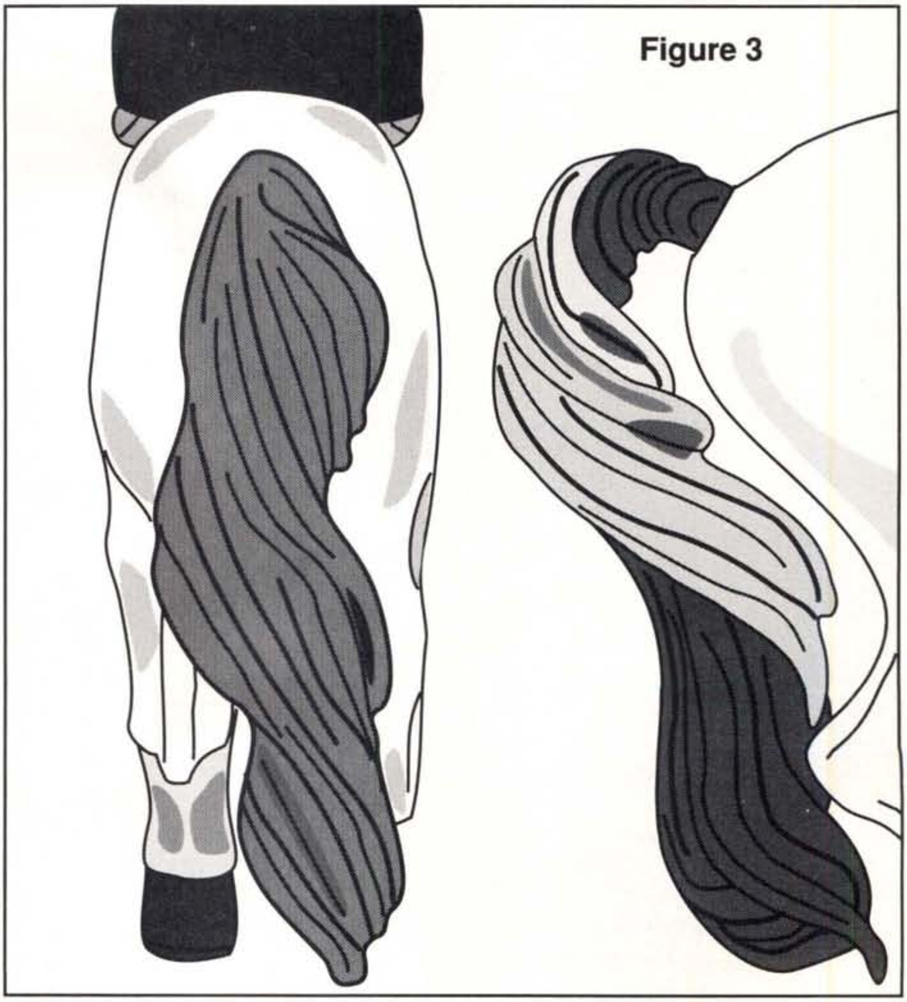


Figure 3

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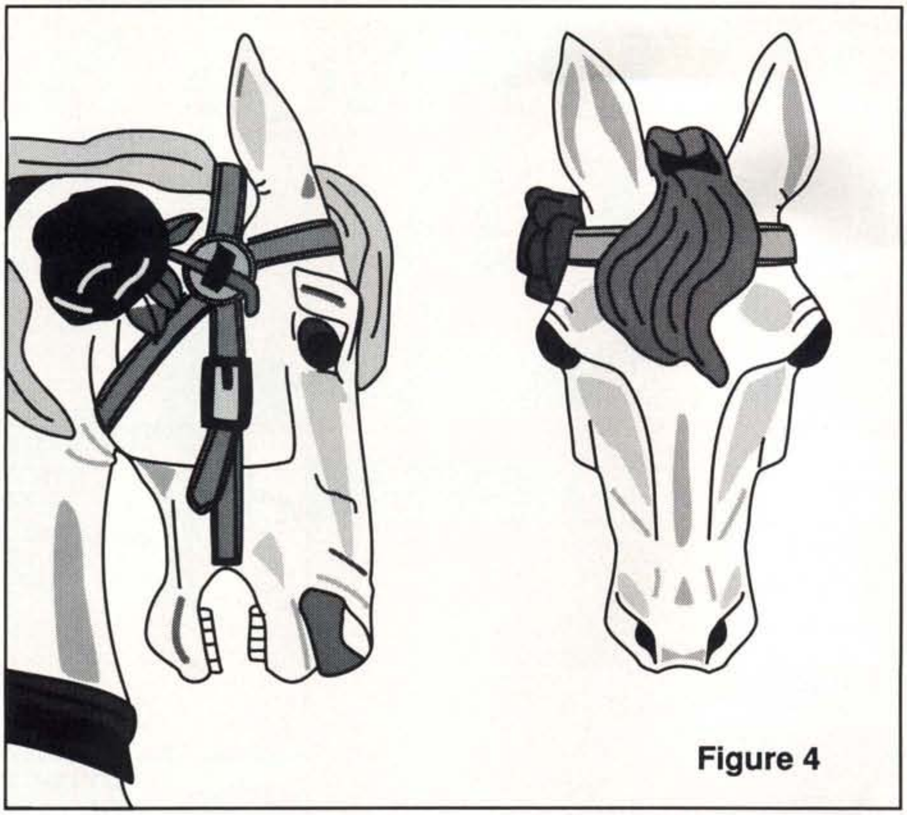

Figure 4

horse you are carving. Remove the block when all the other carving is finished, then finish shaping the saddle and cantle. Figure 2 also shows the initial steps in blocking out where the head has been boxed in and the space between the legs relieved. This space and the legs are each approximately one third the thickness of your carving block. When carving the legs, always start on the outside first. They are in under the body and you want to be certain you have enough wood to give them their proper shape.

The original "Rosebud" has a real horse's tail, but for our carving we will substitute a carved one. Figure 3 shows detailed views of the tail for this pattern. Here is where you can genuinely become flamboyant and let your imagination run away since it is impossible to show all the detailing forms in a simple diagram such as this one. Carving the tail is the most fun part of this carving. From the rear view, note that the tail does not hang straight, but sweeps somewhat over to the romance side where it is attached behind the right hock for strength. Start the tail by drilling holes in the open spaces to remove the material in this region. Then shape the major forms which are shown by the different shadings in the side view. Always start with the major forms first, then progress to the details.

Figure 4 shows enlarged detailed views of the head. This is the most difficult part of the carving and must be done very carefully. Remember that on the original carousels, apprentices weren't allowed to carve the head.That responsibility was left to the master carvers, so be patient and do your best to get the anatomical features correct. Notice where the original carver took artistic liberties to emphasize the eyes and nostrils for effect.

Looking carefully at the facial profile, you will see the slight dish to the face and a somewhat Roman nose which was a characteristic of Allan Herschell's horses. Don't cut open the mouth until after the head has been shaped in its tilted and rotated position. Then start the opening with a coping saw and finish it using your small detailing gouges.

Figure 5 shows the initial steps for blocking out the head after the tilt and rotation have been established. The important step here is the blocking out of the eyes which is done by establishing a working plane in front of the eyes (refer to "Carving an Arabian Stallion—Part 2," *PW* #37, June/July 1987). The eyes are at the widest part of the head and are set on an angle. This angle must be established before you start any carving of the eyes. These cuts along with those that establish the flair of the nostril are shown in the section with the horizontal lines.

Many carvers prefer to finish their carousel animals by painting them to resemble the originals. My preference is to retain the essence of a wood carving by having the animal itself show off the wood grain and painting only the trimmings. In this way the viewer can be sure that the piece is a wood carving and not a ceramic figure. I finish my animals with a half–and–half mixture of McCloskey's Heirloom Clear Varnish, #0007 Flat and #032 Eggshell. I painted the saddle and adornments over this with artists' oil paints. The pole is made from a dowel rod and finished with Treasure Gold, a wax metallic finish. It comes in various tones and I have used the Florentine #CS1020.

Once you have started carving carousel animals you will become captivated and want to do more. In our next article we will provide additional patterns so that you can create a whole collection of miniature carousel figures. PW

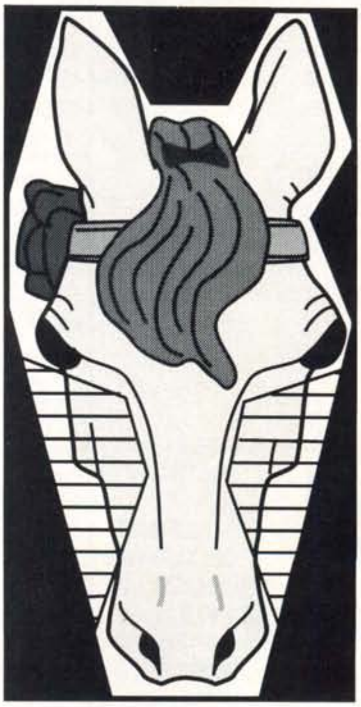

Figure 5

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Modern Bud Vase

by John A. Nelson

This bud vase has an unusual modern profile. It can be made of most any hardwood. Cherry or walnut would make an excellent bud vase. The one pictured here was made out of scrap pieces of ash I had in the shop.

Start with a block of wood 3" square and about 8" long. Try to find one with an interesting grain pattern. Locate the exact center of each end, and use a small nail set to punch a hole about 1/8" deep at each end.

With your table saw set at 45°, trim off the corners to create an octagonal blank. Mount the blank on your lathe and round it to 2-3/4" diameter the entire length, using a gouge. Mark off the 6" overall length and cut about 1" into the stock with the parting tool. Mark off the various diameter locations along the entire length of the blank. Turn to size, and while it's still mounted on the lathe, sand it smooth.

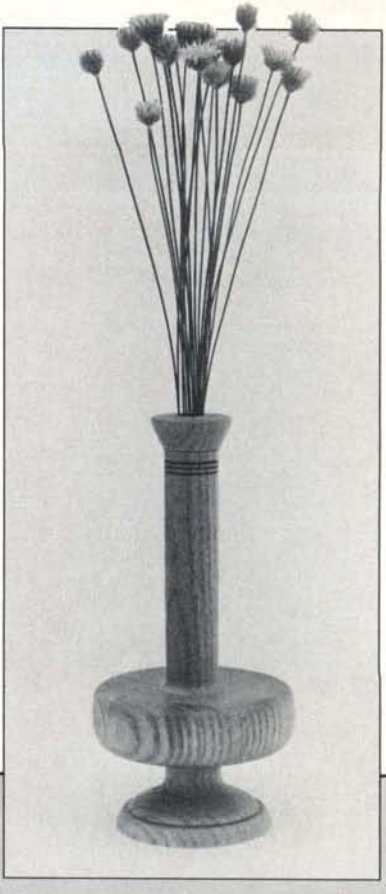
Using the cut–off tool, turn the ends down to nibs of about 1/4" diameter. Apply two or three coats of your favorite finish. Sand between coats so you get a nice smooth, high–gloss finish.

Cut the vase off using the parting tool and smooth the nibs off the ends. Drill a 3/8" diameter hole in the top end about 3" deep. Pour some waterproof polyurethane inside the hole and rotate the vase so it coats the entire hole wall, then pour out the excess. This should waterproof the interior of the bud vase. Another option is to get a glass test tube from a hobby shop, and drill a hole large enough to fit it.

You might wish to add a piece of felt to the bottom surface of the vase so it will not mark up your table top.

Now you have to go out and find a rose for your bud vase. PW

John A. Nelson is the author of numerous books on woodworking and a frequent contributor to Popular Woodworking.



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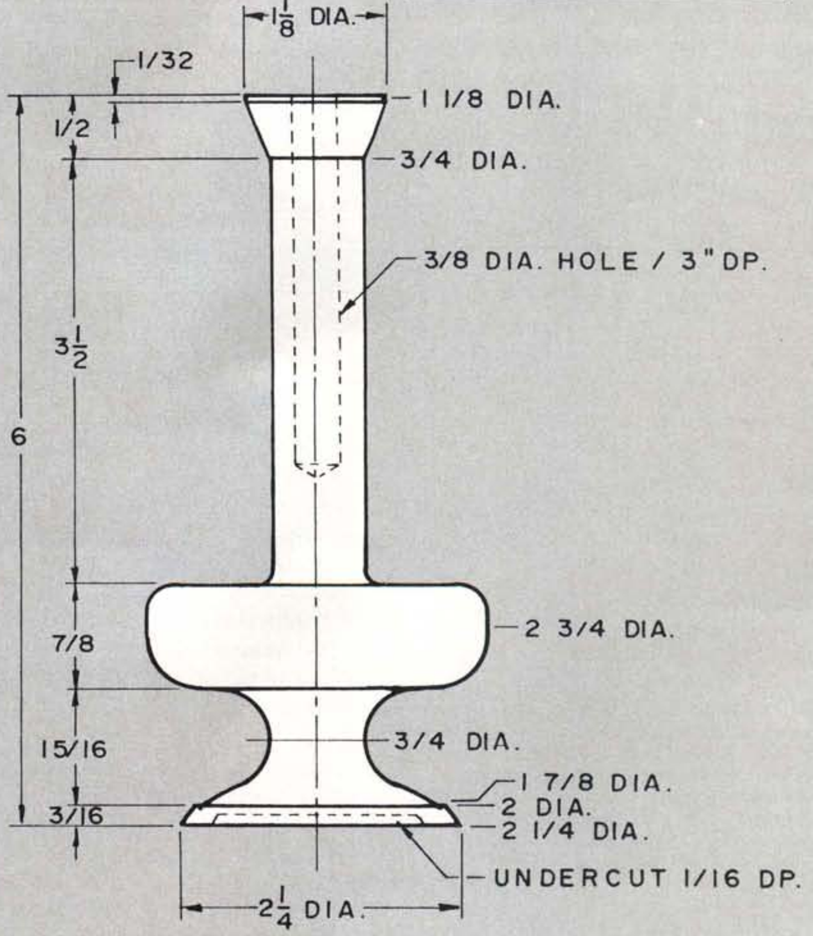

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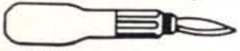

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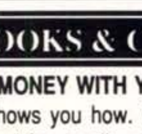

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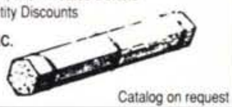

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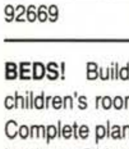

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Out of the Woodwork

by Peter Good

Truly Low-Tech Woodworking

From my early childhood I was a tinkerer and science-minded nerd who was always making things, from radios to secret forts in the woods. The only tools I had to work with were my father's, and they were downright primitive by most standards. The only machine he had was a very small, very old table saw, what we'd call a hobby machine. Other than that, there were a few basic hand tools, most of them elderly and well worn. From the beginning, therefore, I learned how to make one tool do a variety of things. A screwdriver can be a screwdriver, a lever, a chisel, a punch, a scraper, a small hammer (kind of), and if it's got a sharp point, you might even be able to use it to pick out splinters. Pliers can be pliers, a wrench, a hammer, a small anvil, a small pry bar and, you got it, a splinter–puller.

My father also had a standard procedure for fixing mechanical things: soak it in kerosene for a few days or more and it usually got better. So you might say that I learned a kind of frontier version of woodworking because I had little more to work with than the pioneers did.

It was with this sort of background that I went into construction and woodworking. The fact that I also had two college degrees, one of them in architecture, had little, if anything, to do with preparing me to make a living. I had no idea of what a shaper or planer was, and if you told me that a jointer was something to make marijuana cigarettes with, I would have believed you.

The first thing I did was go to the local K–Mart to buy some tools, since I didn't even own a hammer. I bought the world's cheapest circular saw, an even cheaper electric drill, and a minimal assortment of basic hand tools. For less than $50 I equipped myself for woodworking. I threw it all in the back of my VW bus, and I was in business. Twenty years and a countless number of jobs later, I'm still at it. Now I'm a specialty woodworker and have a reputation for fine quality and innovative designs. Funny thing is, I'm still low–tech. I don't mean low–tech as in the use of hand tools instead of electric; I mean like gluing up something and using cement blocks and buckets of joint compound to weight it down instead of clamps. I mean sharpening chisels on a belt sander and making mortises and tenons for doors using nothing but a 10" Rockwell table saw. I've moved up, though, from Truly Low–Tech to Somewhat Low–Tech, which is a cut above. I no longer abuse screwdrivers and pliers quite as cruelly as I once did. I now use a planer, and, about a year ago, used a jointer for the first time (it didn't get me stoned). I have yet to use a shaper, even though my primary business is the manufacturing of upper-end custom doors. I've learned to make the most of the tools and equipment that I have and have developed techniques for performing multiple tasks with a single tool. This obviously reduces not only the number and variety of tools required, but also the size and sophistication of the work space.

The point is, it's not so much the equipment you use as the techniques. It's entirely possible to do good work and run a successful business without going to woodworking school, or having state-of-the-art equipment, or a shop that looks like an industrial showcase. Oh, don't get me wrong. CNC equipment, laminate presses, moulders, and laser cutters all have their places. I'm just saying that with a little creativity, you can do a lot with a table saw, an electric drill, and a few pipe clamps. I've also seen beautiful things produced in shops that were very small, had dirt floors, a few bare bulbs hanging on wires, no dust collection, and were equipped with tools that looked like they were straight out of the Bronze Age.

I can afford a shaper now; it's just that I've gotten to the point where I'm comfortable using other methods to arrive at a similar, but individualized, result. The message in all of this might revolve around using tools, equipment and methods which you're comfortable with and which work for you. Perhaps it even touches on more profound issues like philosophies of woodworking or the future of woodworking as a craft and business. Perhaps we're in a transition stage during which woodworking splits and goes in two completely different directions, one being high–tech mass production in which speed, accuracy, uniformity, and conservation of labor are the prime directives, and the other being low–tech, *individualized*, single item production. In their way, both of these production methods can be state-of-the-art and produce high quality, if perhaps very different results.

For now, however, the essential point is that there's more than one way to do most everything and, in many cases, the ways are not right or wrong; they're just different. What works, works, and that's all that matters. PW

As the owner of Grand Openings in Oakland, California, ***Peter Good*** *manufactures doors. He also gives seminars at national woodworking shows on the business aspects of running a small shop.*

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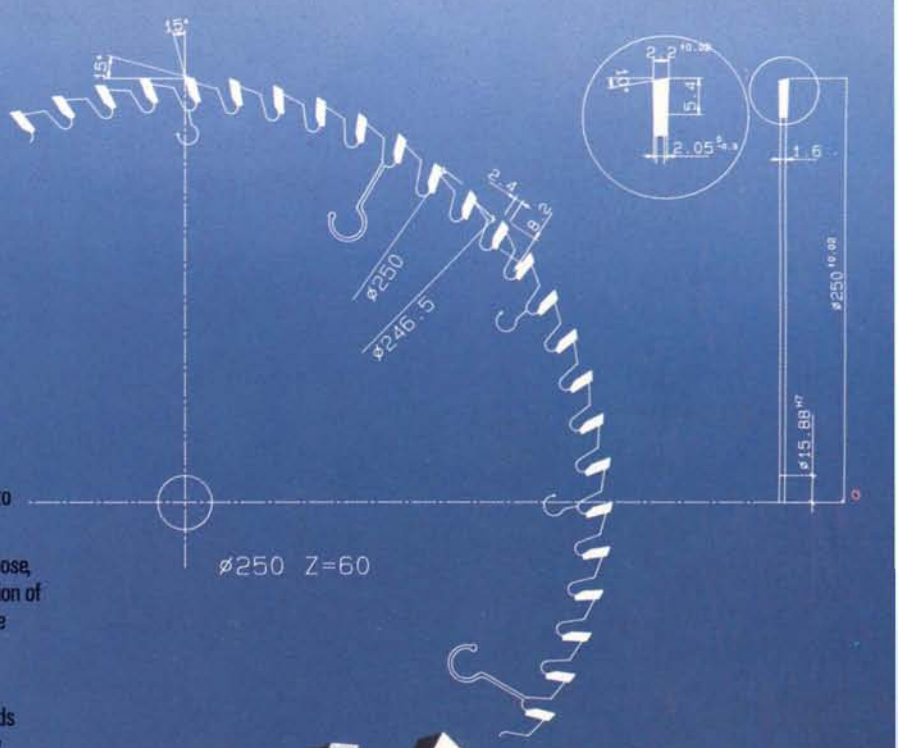

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Thin kerf blade compared to standard kerf blade

Freud thin kerf blades
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